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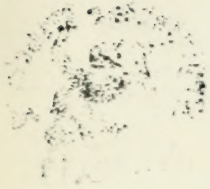

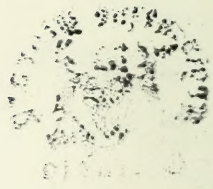

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1. Report of the Auditor General for the year ended 31st March, 1914, Volume I, Parts A, B and A to L; Volume II, Parts M to U; Volume III, Parts V to Z. Presented by Hon. Mr. White, February 9, 1915.. .. .. ..*Printed for distribution and sessional papers.*

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2. The Public Accounts of Canada, for the fiscal year ended 31st March, 1914. Presented by Hon. Mr. White, February 9, 1915 .. .. ..*Printed for distribution and sessional papers.*

3. Estimates of sums required for the service of the Dominion for the year ending on 31st March, 1916. Presented by Hon. Mr. White, February 8, 1915.
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4. Supplementary Estimates of sums required for the service of the Dominion for the year ending on the 31st March, 1915. Presented by Hon. Mr. White, March 9, 1915.
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5. Further Supplementary Estimates of sums required for the service of the Dominion for the year ending on the 31st March, 1915. Presented by Hon. Mr. White, March 27, 1915.
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5*a*. Further Supplementary Estimates for year ending 31st March, 1916. Presented by Hon. Mr. White, March 31, 1915.. .. ..*Printed for distribution and sessional papers.*

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6. List of Shareholders in the Chartered Banks of the Dominion of Canada as on 31st December, 1914. Presented by Hon. Mr. White, February 9, 1915.
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7. Report on certified cheques, dividends, unclaimed balances and drafts or bills of exchange remaining unpaid in Chartered Banks of the Dominion of Canada, for five years and upwards prior to 31st December, 1913. Presented by Hon. Mr. White, April 10, 1915.
Printed for distribution and sessional papers.

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8. Report of Superintendent of Insurance for year 1914. Presented by Hon. Mr. White, 1915.
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9. Abstract of Statement of Insurance Companies in Canada for year ended 31st December, 1914. Presented by Hon. Mr. White, 1914.
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10. Report of the Department of Trade and Commerce for the fiscal year ended 31st March, 1914: Part I.—Canadian Trade. Presented by Sir George Foster, 8th February, 1915.
Printed for distribution and sessional papers.

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10a. Report of the Department of Trade and Commerce for the fiscal year ended 31st March, 1914: Part II.—Canadian Trade with (1) France, (2) Germany, (3) United Kingdom, and (4) United States. Presented by Sir George Foster, 8th February, 1915.
Printed for distribution and sessional papers.

10b. Report of the Department of Trade and Commerce for the fiscal year ended 31st March, 1914: Part III.—Canadian Trade with foreign countries (except France, Germany, the United Kingdom, and United States.) Presented by Sir George Foster, 8th February, 1915.. .. ..*Printed for distribution and sessional papers.*

10c. Report of the Department of Trade and Commerce, for the fiscal year ended 31st March, 1914, (Part IV, Miscellaneous Information.) Presented by Sir George Foster, March 27, 1915.. .. ..*Printed for distribution and sessional papers.*

10d. Report of the Board of Grain Commissioners for Canada. Presented by Sir George Foster, 1914... .. ..*Printed for distribution and sessional papers.*

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10e. Report of the Department of Trade and Commerce for the fiscal year ending 31st March, 1914. Part VI.—Subsidized Steamship Services, with statistics showing steamship traffic to 31st December, 1914, and Estimates for the fiscal year 1915-16. Presented by Sir George Foster, 1915.. .. ..*Printed for distribution and sessional papers.*

10f. Report of Trade and Commerce for fiscal year ended 31st March, 1914. (Part VII.—Trade of Foreign Countries, Treaties and Conventions.) Presented by Sir George Foster, 1915... .. ..*Printed for distribution and sessional papers.*

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15. Report of the Minister of Agriculture for the Dominion of Canada, for the year ended 31st March, 1914. Presented by Hon. Mr. Burrell, February 8, 1915.
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15b. Report of the Veterinary Director General for the year ending 31st March, 1915. Presented by Hon. Mr. Burrell, 1915.. .. .. ..*Printed for distribution and sessional papers.*

16. Report of the Director and Officers of the Experimental Farms for the years ending 31st March, 1914. Presented by Hon. Mr. Burrell, March 1, 1915.
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17. Criminal Statistics for the year ended 30th September, 1913. (Appendix to the Report of the Minister of Trade and Commerce for the year 1913.) Presented by Sir George Foster, 1915.. .. ..*Printed for distribution and sessional papers.*

18. Return of By-elections for the House of Commons of Canada, held during the year 1914. Presented by Hon. Mr. Speaker, March 12, 1915.
Printed for distribution and sessional papers.

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19. Report of the Minister of Public Works on the works under his control for the fiscal year ended 31st March, 1914, Volume I. Presented by Hon. Mr. Rogers, February 8, 1915.
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20. Annual Report of the Department of Railways and Canals, for the fiscal period from 1st April, 1913, to 31st March, 1914. Presented by Hon. Mr. Cochrane, March 12.
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20*a*. Canal Statistics for the season of navigation, 1914. Presented by Hon. Mr. Cochrane, 9th April, 1915.. .. ..*Printed for distribution and sessional papers.*

20*b*. Railway Statistics of the Dominion of Canada, for the year ended 30th June, 1914. Presented by Hon. Mr. Cochrane, March 12, 1915.
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20*c*. Ninth Report of the Board of Railway Commissioners for Canada, for the year ending 31st March, 1914. Presented by Hon. Mr. Cochrane, February 8, 1915.
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20*d*. Telephone Statistics of the Dominion of Canada, for the year ended 30th June, 1914. Presented by Hon. Mr. Cochrane, March 17, 1915.
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20*e*. Express Statistics of the Dominion of Canada for year ended 30th June, 1914. Presented by Hon. Mr. Cochrane, 1915... .. ..*Printed for distribution nad sessional papers.*

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21*b*. Report and evidence in connection with the Royal Commission appointed to investigate the disaster of the *Empress of Ireland*. Presented by Hon. Mr. Hazen, 1914.
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22. List of Shipping issued by the Department of Marine and Fisheries, being a list of vessels on the registry books of the Dominion of Canada on 31st December, 1914. Presented by Hon. Mr. Hazen, 1915... .. ..*Printed for distribution and sessional papers.*

23. Supplement to the Forty-seventh Annual Report of the Department of Marine and Fisheries for the fiscal year 1913-14—Steamboat Inspection Report. Presented by Hon. Mr. Hazen, March 3, 1915 .. ..*Printed for distribution and sessional papers.*

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25b. Annual Report of the Topographical Surveys Branch of the Department of the Interior, 1912-13. Presented by Hon. Mr. Roche, 1914.
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25c. Report of progress of stream measurements for calendar year of 1914. Presented by Hon. Mr. Roche, 1914.. .. ..*Printed for distribution and sessional papers.*

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25e. Report on Bow River Water Power and Storage Investigations, seasons 1911-1912-1913. Presented by Hon. Mr. Burrell, 1915.. ..*Printed for distribution and sessional papers.*

25f. Report of the British Columbia Hydrographic Survey for the calendar year 1913. Presented by Hon. Mr. Burrell, 1915.. ...*Printed for distribution and sessional papers.*

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26. Summary Report of the Geological Survey, Department of Mines, for the calendar year 1913. Presented, 1915.. .. ..*Printed for distribution and sessional papers.*

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28. Report of the Royal Northwest Mounted Police, 1914. Presented by Hon. Sir Robert Borden, 8th February, 1915 .. ..*Printed for distribution and sessional papers.*

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29. Report of the Secretary of State of Canada for the year ended 31st March, 1914. Presented by Hon. Mr. Coderre, 9th February, 1915.
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29b. Report of the work of the Public Archives for the year 1913. Presented, 1915.
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30. The Civil Service List of Canada, 1914. Presented by Hon. Mr. Coderre, 9th February, 1915.. .. ..*Printed for distribution and sessional papers.*

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31. Sixth Annual Report of the Civil Service Commission of Canada for the year ended 31st August, 1914. Presented by Hon. Mr. Coderre, 19th March, 1915.
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32. Annual Report of the Department of Public Printing and Stationery for the year ended 31st March, 1914. Presented by Hon. Mr. Coderre, 6th April, 1915
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33. Report of the Secretary of State for External Affairs for the year ended 31st March, 1914. Presented by Sir Robert Borden, 18th February, 1915.
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34. Report of the Minister of Justice as to Penetentiaries of Canada, for the fiscal year ended 31st March, 1914. Presented, 1915.. .. .. ..*Printed for distribution and sessional papers.*

35. Report of the Militia Council for the Dominion of Canada, for the fiscal year ending 31st March, 1914. Presented by Hon. Mr. Hughes, 10th February, 1915.
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36. Report of the Department of Labour for the fiscal year ending 31st March, 1914. Presented by Hon. Mr. Crothers, 8th February, 1915.
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36*a*. Seventh Report of the Registrar of Boards of Conciliation and Investigation of the proceedings under "The Industrial Disputes Investigation Act, 1907," for the fiscal year ending 31st March, 1914. Presented by Hon. Mr. Crothers, 8th February, 1915.
Printed for distribution and sessional papers.

37. Tenth Annual Report of the Commissioners of the Transcontinental Railway, for the year ended 31st March, 1914. Presented by Hon. Mr. Cochrane, 8th February, 1915.
Printed for distribution and sessional papers.

37*a*. Interim Report of the Commissioners of the Transcontinental Railway, for the nine months ended 31st December, 1914. Presented by Hon. Mr. Cochrane, 15th February, 1915.. .. .. .

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45. Return to an Order of the House of the 20th April, 1914, for a copy of all letters, papers, tenders and other documents in regard to the purchase of any cars for the Intercolonial Railway during the years 1912 and 1913. Presented 9th February, 1915.—*Mr. Macdonald*.. .. .. .

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of convicts; dates of conviction; crime of which convicted; sentences passed; by whom sentenced; sentences commuted, and if so, to what. 3. For a return showing all persons in Canada, and each province, convicted during the above mentioned period of murder whose sentences have been mitigated, or who have received a free pardon, together with a statement of the offences of which they were severally convicted, with the name of convicts; dates of conviction; nature of offence; sentences; and extent of mitigation of sentences and dates. 4. For a return of instances, during the above mentioned period, in which appeal has been made on behalf of the persons convicted of capital offences to His Excellency, the Governor in Council, for the exercise of the Royal Prerogative of pardon, or mitigation of sentences, with the name of convicts; dates of conviction and place; crime of which convicted; sentences; dates of appeal; and the result. Presented 9th February, 1915.—*Mr. Wilson (Laval)*.. ..*Not printed.*

54. General Rules and Orders of the Exchequer Court of Canada made, respectively, on the 23rd September, 1914, and the 18th June, 1914. Presented by Hon. Mr. Coderre, 9th February, 1915.. .. ..*Not printed.*

54*a*. General Rules and Orders of the Exchequer Court of Canada made on the 15th February, 1915. Presented by Hon. Mr. Coderre, 16th March, 1915... .. ..*Not printed.*

55. Ordinances of the Yukon Territory passed by the Yukon Council in the year 1914. Presented by Hon. Mr. Coderre, 9th February, 1915... .. ..*Not printed.*

56. Return to an Order of the House of the 18th May, 1914, for a return showing the details of moneys paid to J. F. Farrington, $248.25; B. H. Smith, $469.50, and H. C. Dash, $182.40, as set forth in *Hansard* of this session, page 3071. Presented 9th February, 1915.—*Mr. McLean (Halifax)*... .. ..*Not printed.*

57. Return to an Order of the House of the 16th March, 1914, for a copy of instruction sent to Mr. Wm. Flynn, advocate, to hold investigations into charges made against employees of the Department of Marine and Fisheries in Bonaventure County, and reports made by him in such investigations. Presented 9th February, 1915.—*Mr. Marcil (Bonaventure)*.. .. ..*Not printed.*

58. Return to an Order of the House of the 27th April, 1914, for a copy of all documents bearing upon the application made to the Department of Marine and Fisheries for the dismissal of Ulric Dion, lightkeeper at St. Charles de Caplan, Quebec, and the appointment of Omer Arsenault in his place, and on the action taken by the Department in that connection. Presented 9th February, 1915.—*Mr. Marcil (Bonaventure).*
Not printed.

59. Return to an Order of the House of the 9th February, 1914, for a copy of all agreements made and entered into between the Department of Marine and Fisheries or the Government and Railway and Express Companies, including the Intercolonial Railway, relating to the transportation of fresh fish by fast freight or express, since the year 1906; also a copy of all guarantees given to railway and express companies by the Government or any Department thereof, relating to such transportation, together with a statement of all disbursements made by the Department of Marine and Fisheries each year under the terms of such agreements or guarantees, distinguishing between disbursements made on account of fast freight and disbursements made on account of express shipments; also the number of refrigerator cars, subject to guarantee, by Department of Marine and Fisheries, forwarded by fast freight from Mulgrave or Halifax to Montreal, each calendar year since 1906, and the number of tons of freight carried by such cars each year. Also the number of refrigerator express cars forwarded from said points, Mulgrave and Halifax to Montreal, up to December 31, 1913, under the terms of an agreement made since 1911, between the Department of Marine and Fisheries and the railway or express companies or both. Also the number of tons of fresh fish carried by express companies, prior to December 31, 1913, under the last mentioned agreement; and the amount paid up to December 31, 1913, by the Department of Marine and Fisheries, under the last mentioned agreement. Also the number of tons of fresh fish carried by express companies from Mulgrave and Halifax to points west since 1906, on which the Government paid one-third, but not under the terms of the said agreement made as aforesaid, since 1911. Presented 9th February, 1915.—*Mr. Sinclair*.. .. ..*Not printed.*

60. Return to an Order of the House of the 20th April, 1914, for a return showing all the post offices in the several counties in the province of Nova Scotia for which a rent allowance, or a fuel fund, and light allowance is made, specifying the amount of such allowance in each case. Presented 9th February, 1914.—*Mr. Chisholm (Antigonish).*
Not printed.

61. Return to an Order of the House of the 16th March, 1914, for a copy of all correspondence, letters, telegrams, etc., in the year 1913, relating to the carrying of the mails between Grand River Falls and Grand River, county of Richmond, and the awarding of the contract to Malcolm McCuspic. Presented 9th February, 1915.—*Mr. Kyte.*
....*Not printed.*

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62. Return to an Order of the House of the 11th May, 1914, for a copy of all letters, telegrams, correspondence and memorials since the 1st day of November, 1911, relating to the post office at Johnstown, Richmond County, N.S., and to complaints against the present postmaster and recommendations for his dismissal. Presented 9th February, 1915.—*Mr. Kyte* . . . . . *Not printed.*

63. Return to an Order of the House of the 20th April, 1914, for a copy of all papers, petitions, letters and telegrams concerning the change of site of the post office at St. Lazare Village, county of Beauharnois, Quebec. Presented 9th February, 1915.—*Mr. Lemieux.* . . . . *Not printed.*

64. Statement of Governor General's Warrants issued since the last Session of Parliament on account of 1914-15. Presented by Hon. Mr. White, 9th February, 1915. *Not printed.*

65. Statement of expenditure on account of "Miscellaneous Unforeseen Expenses," from the 18th August, 1914, to the 4th February, 1915, in accordance with the Appropriation Act of 1914. Presented by Hon. Mr. White, 9th February, 1915. . . . . *Not printed.*

66. Statement of Superannuation and Retiring Allowances in the Civil Service during the year ending 31st December, 1914, showing name, rank, salary, service, allowance and cause of retirement of each person superannuated or retired, also whether vacancy is filled by promotion or by appointment, and salary of any new appointee. Presented by Hon. Mr. White, 9th February, 1915. . . . . *Not printed.*

67. Statement of receipts and expenditures of the Ottawa Improvement Commission to 31st March, 1914. Presented by Hon. Mr. White, 9th February, 1915. . . . . *Not printed.*

68. Statement of the affairs of the Royal Society of Canada, for the year ended 30th April, 1914. Presented by Hon. Mr. White, 9th February, 1915. . . . . *Not printed.*

69. Account of the average number of men employed on the Dominion Police Force during each month of the year 1914, and of their pay and travelling expenses, pursuant to Chapter 92, Section 6, Subsection 2, of the Revised Statutes of Canada. Presented by Hon. Mr. Doherty, 10th February, 1915. . . . . *Not printed.*

70. Return to an Order of the Senate, dated the 16th January, 1913, calling for copy of the plans, reports, soundings, and other germane information respecting the ports of Churchill and Fort Nelson, so far as the Department of Railways and Canals is concerned.—(*Senate*) . . . . . *Not printed.*

71. Return to an Order of the Senate, dated the 29th April, 1914, showing:—1. Titles of all books, pamphlets and other printed papers issued by the King's Printer during the year ending on the 31st of March, 1914. 2. The number of each of such books, pamphlets and papers printed during such year, and the number distributed, with the dates of distribution. 3. The number of pages in each. 4. The cost of each. 5. The authority for the printing and issuing of each of such books, pamphlets and papers.—(*Senate*) . . . . . *Not printed.*

72. Return to an Order of the Senate dated the 30th April, 1914, for the production of all proposals submitted to the Government for the construction of the Montreal, Ottawa and Georgian Bay Canal and all the correspondence relating thereto.—(*Senate*). *Not printed.*

72*a*. Return to an Order of the House of the 11th February, 1915, for a copy of all petitions and memoranda from commercial bodies or other parties in relation to the immediate construction of the Georgian Bay Canal, and of all correspondence in connection with the same since 21st September, 1911. Presented 4th March, 1915.—*Sir Wilfrid Laurier.* *Not printed.*

73. Copies of general orders promulgated to the militia for the period between 25th November, 1913, and 24th December, 1914.—(*Senate*) . . . . . *Not printed.*

74. Copy of correspondence respecting the control of the exportation of nickel. Presented by Sir Robert Borden, 11th February, 1915. . . . . *Not printed.*

75. Memorandum respecting work of the Department of Militia and Defence—European War, 1914-15. Presented by Hon. Mr. Hughes, 11th February, 1915. . . . . *Not printed.*

76. Return to an Order of the House of the 6th April, 1914, for a copy of all correspondence, letters, telegrams, complaints and documents of all kinds received by the Department of Trade and Commerce during the years 1913-14, with respect to the Pictou-Mulgrave-Chéticamp steamship route. Presented 11th February, 1915.—*Mr. Chisholm (Inverness).* . . . . . *Not printed.*

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77. Return to an Order of the House of the 8th June, 1914, for a copy of all documents bearing on an application or applications made to the Superintendent General of Indian Affairs or the Department, on an amendment to the Indian Act to facilitate the sale of the Indian Reserve of Restigouche, Que., or on the acquiring otherwise of any portion or the whole of the said reserve for industrial or other purposes, and any answers given thereto. Presented 11th February, 1915.—*Mr. Marcil (Bonaventure).*
Not printed.

78. Return to an Order of the House of the 2nd February, 1914, for a return showing the names of the sailors who have been employed on the *Eureka* during the years 1910, 1911, 1912 and 1913. Presented 12th February, 1915.—*Mr. Boulay*.. .. .. ..*Not printed.*

79. Return to an Order of the House of the 15th April, 1914, for a return showing the total bond issue of the Canadian Northern Railway Company and its affiliated companies; and the total cost to date of the construction of the lines of railways comprising the Canadian Northern Railway system, including terminals, sidings, etc. Presented 12th February, 1915.—*Mr. Murphy*.. .. ..*Not printed.*

80. Return to an Order of the House of the 18th May, 1914, for a copy of all papers, documents, reports and evidence relative to the dismissal or proposed dismissal of W. A. Case of the Government Quarantine Service at Halifax, N.S. Presented 12th February, 1915.—*Mr. McLean (Halifax)* .. ..*Not printed.*

81. Return to an Order of the House of the 26th February, 1914, for a return showing:—1. The freight rates charged during the years 1912 and 1913, on wheat from Canadian ports to ports in the United Kingdom by the Canadian Pacific Railway Company's Steamship Lines, the Allan Steamship Line and the Canadian Northern Railway Company's Steamship Lines. 2. The profits made by the freight boats of the said several lines which carried wheat alone or with other freight. Presented 12th February, 1915. —*Sir James Aikins*.. .. ..*Not printed.*

82. Return to an Order of the House of the 16th February, 1914, for a copy of all reports, requests, petitions, memorials, letters, telegrams and other correspondence and documents relating to the removal, suspension or dismissal, by the management of the Intercolonial Railway, of Warren Carter and Frederick Avard, employees in the freight department of the Intercolonial Railway at Sackville, N.B.; and of all letters, telegrams and other correspondence in the Department of Railways and Canals, or in the railway offices at Moncton, or in any Department of Government, addressed to the Minister of Railways and Canals, or to any other member of the Government, or to any official of the Department of Railways and Canals, or of the Intercolonial Railway, by any person or persons in the county of Westmorland, N.B., in any manner relating to said employees and to the dispensing with their services, particularly of any letters sent to F. P. Brady, General Superintendent of the Intercolonial, by any party or parties in Sackville, N.B., or elsewhere, and of all replies to any such letters, correspondence or documents. Presented 12th February, 1915.—*Mr. Emmerson.*
Not printed.

83. Return to an Order of the House of the 23rd March, 1914, for a return showing:—1. What investigations and other work have been entrusted by the Government, or any Department thereof, to G. Howard Ferguson, member for the electoral division of the county of Grenville in the Legislative Assembly of the province of Ontario. 2. How much the said G. Howard Ferguson has been paid by the Government, or any Department thereof, for fees and disbursements since the 21st of September, 1911, and how much is still due and owing to him. 3. How much has been paid to the said G. Howard Ferguson by the Government or any Department thereof, since the 21st September, 1911, in connection with any other matter whatever. Presented 12th February, 1915.—*Mr. Proulx*.. .. ..*Not printed.*

84. Further Supplementary Return to an Order of the House of the 28th April, 1913, for a return showing a list of all the newspapers in Canada in which advertisements have been inserted by the Government, or any minister, officer or department thereof, between 10th October, 1911, and the present date, together with a statement of the gross amount paid therefor between the above dates to each of said newspapers or to the proprietors of the same. Presented 12th February, 1915.—*Mr. Sinclair*.. .. ..*Not printed.*

84*a*. Further Supplementary Return to an Order of the House of the 30th April, 1913, for a return showing a list of all the newspapers in Canada in which advertisements have been inserted by the Government, or any minister, officer or department thereof, between the 10th day of October, 1906, and 10th October, 1907, and between said dates in each of the years following up to the 10th October, 1911, together with a statement of the gross amount paid therefor for the years mentioned, to each of the said newspapers or the proprietors of the same. Presented 12th February, 1915.—*Mr. Thornton.*
Not printed.

CONTENTS OF VOLUME 28—*Continued.*

85. Partial Return to an Order of the House of the 4th March, 1914, for a return showing:—1. How many employees of the Federal Government of Canada, including all services and all departments, have been dismissed from 10th October, 1911, to the present date. 2. How many have resigned. 3. How many have deserted the service. 4. How many deserters have been punished. 5. How many new employees have been engaged or appointed by the present Government during the same period. Presented 12th February, 1915.—*Mr. Boivin*.. .. ..*Not printed.*

85*a*. Return to an Order of the House of the 4th March, 1914, for a return showing:—1. How many employees of the Federal Government of Canada, including all services and all departments, have been dismissed from 10th October, 1911, to the present date. 2. How many have resigned. 3. How many have deserted the service. 4. How many deserters have been punished. 5. How many new employees have been engaged or appointed by the present Government during the same period. Presented 4th March, 1915.—*Mr. Boivin*.. .. ..*Not printed.*

85*b*. Further Supplementary Return to an Order of the House of the 4th March, 1914, for a return showing:—1. How many employees of the Federal Government of Canada, including all services and all departments, have been dismissed from 10th October, 1911, to the present date. 2. How many have resigned. 3. How many have deserted the service. 4. How many deserters have been punished. 5. How many new employees have been engaged or appointed by the present Government during the same period. Presented 5th March, 1915.—*Mr. Boivin*.. .. ..*Not printed.*

85*c*. Further Supplementary Return to an Order of the House of the 4th March, 1914, for a return showing:—1. How many employees of the Federal Government of Canada, including all services and all departments, have been dismissed from 10th October, 1911, to the present date. 2. How many have resigned. 3. How many have deserted the service. 4. How many deserters have been punished. 5. How many new employees have been engaged or appointed by the present Government during the same period. Presented 12th March, 1915.—*Mr. Boivin*.. .. ..*Not printed.*

85*d*. Further Supplementary Return to an Order of the House of the 4th March, 1914, for a return showing:—1. How many employees of the Federal Government of Canada, including all services and all departments, have been dismissed from 10th October, 1911, to the present date. 2. How many have resigned. 3. How many have deserted the service. 4. How many deserters have been punished. 5. How many new employees have been engaged or appointed by the present Government during the same period. Presented 7th April, 1915.—*Mr. Boivin*.. .. ..*Not printed.*

86. Further Supplementary Return to an Order of the House of the 18th February, 1914, for a copy of all charges, complaints, memorials, correspondence and telegrams, not already produced, relating to officials in any department of the Government since 10th October, 1911, the number of officials dismissed, reports of investigations held in respect of such charges, items of expenditure and costs of each investigation, the names of persons appointed to office in the place of dismissed officials, and of all recommendations received in behalf of persons so appointed in the province of Prince Edward Island. Presented 12th February, 1915.—*Mr. Hughes* (*Kings, P.E.I.*)
Not printed.

87. Partial Return to an Order of the House of the 18th May, 1914, for a return showing in all cases in which Charles Seager, of Goderich, acted as Government Commissioner in the investigation of officials charged with partizanship, or other offences, from and including the year 1896 to the year 1900; and the names of all officials dismissed by reason of the reports of the said Charles Seager, the positions held by such officials, and when such dismissals took place; with a copy of the evidence taken in all such cases, together with the commissioners reports thereon, and also showing what fees were paid to the said Charles Seager for conducting such investigations. Presented 12th February, 1915.—*Mr. Clark* (*Bruce*).. .. ..*Not printed.*

88. Return to an Order of the House of the 16th March, 1914, for a copy of all correspondence, letters, telegrams, complaints and of all other documents in any way referring to the operation of the salmon hatchery at North East Margaree, and the fish pond at Margaree Harbour from 1911 to date. Presented 15th February, 1915.—*Mr. Chisholm* (*Inverness*).. .. ..*Not printed.*

89. Return to an Address to His Royal Highness the Governor General of the 11th May, 1914, for a copy of all letters, telegrams, Orders in Council, contracts, tenders, papers and other documents in possession of the Department of Public Works, and of the Department of Militia and Defence, relating to the construction of an armoury at Amherst, N.S. Presented 15th February, 1915.—*Mr. Sinclair*... .. ..*Not printed.*

90. Letters of the Honourable Louis P. Pelletier, M.P., and the Honourable Wilfrid B. Nantel, M.P., resigning their positions as Postmaster General and Minister of Inland Revenue, respectively, and letters of the Prime Minister in acknowledgment thereof. Presented by Sir Robert Borden, 15th February, 1915.. .. ..*Not printd.*

CONTENTS OF VOLUME 28—*Continued.*

91. Report of Board of Officers on boots supplied to the Canadian Expeditionary Force. Presented by Hon. Mr. Hughes, 15th February, 1915.. .. ..*Not printed.*

92. Regulations under "The Destructive Insect and Pest Act." Presented by Hon. Mr. Burrell, 16th February, 1915... .. ..*Not printed.*

93. Report on "The Agricultural Instruction Act," 1913-14, pursuant to Section 8 of the above named Act. Presented by Hon. Mr. Burrell, 16th February, 1915.
Printed for sessional papers only.

93*a*. Supplementary Return to an Address to His Royal Highness the Governor General of the 9th February, 1914, for a copy of all arrangements made between the Government and the various provinces under the Agricultural Instruction Act. Presented 19th February, 1915.—*Sir Wilfrid Laurier*.. .. ..*Not printed.*

93*b*. Return to an Order of the House of the 20th April, 1914, for a copy of all documents, correspondence, letters, petitions, reports, etc., exchanged between Dr. C. C. James, Mr. J. C. Chapais and each of the Provincial Ministers of Agriculture, in connection with the distribution and the administration of the federal subsidy granted to the provinces for agricultural purposes since the granting of same. Presented 23rd February, 1915. —*Mr. Lapointe (Kamouraska)*.. .. ..*Not printed.*

94. Return to an Order of the House of the 11th February, 1914, for a copy of all telegrams, correspondence, instructions, recommendations, and other documents that passed between the Shellfish Fishery Commission of 1913, and the Department of Marine and Fisheries, from the date of the appointment of said Commission to 31st December, 1913, excluding such documents as have been printed in the published report of said Commission. Presented 16th February, 1915.—*Mr. Sinclair*.. .. ..*Not printed.*

95. Return to an Order of the House of the 16th March, 1914, for a copy of all correspondence, tenders, telegrams, complaints and of all other documents in any way referring to the collecting of spawn for the Margaree Lobster Hatchery during the years 1911-12, 1912-13 and 1913-14. Presented 16th February, 1915.—*Mr. Chisholm (Inverness).*
Not printed.

96. Return to an Order of the House of the 10th February, 1915, for a return showing the amount of coal imported into Alberta, Saskatchewan and Manitoba, respectively, from the United States during the year 1914; also the amount of duty collected in each of the said provinces during the same year. Presented 16th February, 1915.—*Mr. Buchanan*... .. ..*Not printed.*

97. Copy of the Eighth Joint Report of the Commissioners for the Demarcation of the Meridian of the 141st Degree of West Lngitude. Presented by Hon. Mr. Roche, 18th February, 1915.. .. ..*Not printed.*

98. Return to an Order of the House of the 20th April, 1914, for a copy of the agreement between the Government of Canada and the Canadian Pacific Railway Company at the time the special land grant was made whereby the Canadian Pacific Railway Company were enabled to get their land grant in one block for the purpose of establishing their present irrigation system east of Calgary, province of Alberta. Presented 18th February, 1915.—*Mr. Burnham*.. .. ..*Not printed.*

99. Return to an Order of the House of the 23rd March, 1914, for a copy of all letters, telegrams and other documents in connection with the sale of any timber on Parry Island, Parry Sound District, and of advertisements, agreements for purchase and any other documents connected with such sale or grant of timber to any person or persons. Presented 18th February, 1915.—*Mr. Arthurs*.. .. ..*Not rpinted.*

100. Return to an Order of the House of the 11th February, 1914, for a return showing reasons for the dismissal of Mr. Larivière, Dominion Lands Agent at Girouard; the date of his appointment and of dismissal and salary at time of dismissal; also the name of agent appointed in his place, with date of appointment and salary. Presented 18th February, 1915.—*Mr. Oliver*.. .. ..*Not printed.*

101. Annual Return respecting Trade Unions under Chapter 125, R.S.C., 1906. Presented by Hon. Mr. Coderre, 18th February, 1915.. .. ..*Not printed.*

102. A detailed statement of all bonds or securities registered in the Department of the Secretary of State of Canada, since last return (21st January, 1914) submitted to the Parliament of Canada under Section 32 of Chapter 19, of the Revised Statutes of Canada, 1906. Presented by Hon. Mr. Coderre, 18th February, 1915.. .. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

103. Return to an Order of the House of the 9th February, 1914, for a copy of all petitions, memorials, letters, telegrams, papers, and documents received by any department of the Government of Canada, or any Minister of the Crown from any company, corporation, person or persons, requesting the removal of any customs duties upon wheat or wheat products entering Canada, or protesting against any diminution or removal of such custom's duties, and any replies thereto. Presented 18th February, 1915.—*Mr. Maclean (Halifax)*.. .. .. .

CONTENTS OF VOLUME 28—*Continued.*

112. Return to an Order of the House of the 15th February, 1915, for a copy of all letters, telegrams, minutes of investigation and other documents relating to the dismissal of James Brennan, fireman Intercolonial Railway at Stellarton. Presented 25th February, 1915.—*Mr. Macdonald*.. .. ..*Not printed.*

113. Return to an Order of the House of the 11th February, 1915, for return showing if any official statement was given on behalf of the management of the Intercolonial Railway to the effect that wages would be paid in their absence to the employees of the railway who volunteered for active service. If so, when and by whom? If any order has been made by the Railway Department providing for such payment, and if so, when the said order was made. Presented 23rd February, 1915.—*Mr. Macdonald*.. .. .. ..*Not printed.*

114. Return to an order of the House of the 9th February, 1915, for a copy of all papers, petitions, letters and telegrams exchanged between the Quebec Board of Trade and the Department of Railways and Canals concerning the circulation of trains on that section of the National Transcontinental Railway between Cochrane and Quebec City. Presented 23rd February, 1915.—*Mr. Lemieux*.... .. ..*Not printed.*

115. Return (in so far as the Department of the Interior is concerned) of copies of all Orders in Council, plans, papers and correspondence relating to the Canadian Pacific Railway, which are required to be presented to the House of Commons, under a resolution passed on 20th February, 1882, since the date of the last return, under such resolution. Presented by Hon. Mr. Roche, 24th February, 1915.. .. ..*Not printed.*

116. Return showing:—1. Who the Remount Commissioners are for Western and Eastern Canada respectively? 2. When and by whom they were appointed, and what their general instructions were? 3. Why were the mobilization orders 1913, which provide for the purchase of remounts, ignored and civilians put in charge of the purchase of remounts? 4. The names of the purchasers and inspecting veterinary officers appointed by the Remount Commissioner for Eastern Canada, in the various remount divisions? 5. If any of the purchasers and inspecting veterinary officers have been stopped buying. If so, what their names are, and the reasons given by the Remount Commissioner for his action? 6. How many horses have been purchased between 1st December and 31st January, in each remount division in Eastern Canada, and the average price paid per horse? 7. What the average cost per horse is in each remount division to cover the expenses, including pay or allowances and all travelling and other expenses, between the said dates. Presented 24th February, 1915.—*Mr. Lemieux*..*Not printed.*

117. Return showing:—1. From how many firms the Government have ordered ankle boots for the various contingents now being equipped for service? 2. The names of these firms? 3. How many ankle boots have been ordered from each firm? 4. How many ankle boots each firm have delivered up to date? 5. How many ankle boots each firm have yet to deliver? 6. The price that each firm is receiving for these ankle boots. Presented 24th February, 1915.—*Mr. Lemieux*.. .. ..*Not printed.*

118. Return to an Order of the House of the 22nd February, 1915, for a copy of all correspondence, recommendations, tenders and other papers on file in the office of the Department of Railways and Canals relating to supplying ice for the Intercolonial Railway at Mulgrave for the year 1915. Presented 25th February, 1915.—*Mr. Sinclair.*

Not printed.

119. Return to an Order of the House of the 18th February, 1915, for a return showing:—1. How many motor trucks were sent with the first contingent to England? 2. From whom they were purchased, and by whom they were manufactured? 3. What their capacity was? 4. What price was paid for them? 5. If any expert was employed by the Government in connection with their purchase. If so, who? 6. If any commission was paid by the Government to any one in connection with their purchase? 7. If the trucks have given satisfaction in service. If not, what defects were exhibited? 8. If a committee was appointed by the Militia Department or the Government in regard to the purchase of motor trucks for the second and further contingents. If so, who comprised it, and what were their special qualifications? 9. If one, Mr. McQuarrie, was a member of this committee. If so, is it true he was, and is still, an employee of the Russell Motor Car Company of Toronto? 10. If one, Owens Thomas, was employed as expert on the said Committee? If so, what he was paid, or what he is to be paid for his services, and how long his services were utilized? 11. If Mr. Thomas received any commission in connection with the purchases of motor trucks either from the Government or the manufacturers? 12. What recommendations were made by the said committee to the Militia Department or the Government in connection with purchases of motor trucks? 13. If the trucks have been purchased. If so, how many, from whom, and at what price? 14. If it is true that these trucks were purchased from the Kelly Company, Springfield, Ohio. If so, could not efficient and suitable trucks have been procured from Canadian manufacturers? 15. If it is true that the Government has decided to go into the motor truck business by placing orders with Canadian manufacturers for parts, and supplying such parts to assemblers in Canada. If so, is it true that orders have been, or are being placed with the Russell Motor Car Company, to manufacture engines? 16. Who recommended Mr. Thomas to the Minister of the Militia or the Government?. Presented 25th February, 1915.—*Mr. Copp.*

Not printed.

CONTENTS OF VOLUME 28—*Continued.*

120. Return to an Order of the House of the 15th February, 1915, for a return showing whether any expenditures of food-stuffs have been made since 1st August last, to European countries, other than the United Kingdom, France and Belgium, and if so, their nature and what countries. Presented 25th February, 1915.—*Mr. Crothers.*
Not printed.

121. Return to an Order of the House of the 11th February, 1915, for a copy of the petition, papers, documents and letters in connection with the incorporation of the Dominion Trust Company, incorporated by Special Act of the Parliament of Canada in 1912, being Chapter 89 of 2 George V. Presented 25th February, 1915.—*Mr. Proulx.*
Not printed.

121*a*. Return to an Order of the House of the 11th February, 1915, for a copy of all the correspondence exchanged between the Department of Justice and the Government of the province of British Columbia, or any of its members, with regard to a certain Act passed by the Legislature of the said province in 1913, being Chapter 89 of 2 George V., entitled: "An Act respecting the Dominion Trust Company." Presented 4th March, 1915.—*Mr. Proulx*.. .. .. .

CONTENTS OF VOLUME 28—*Continued.*

128*b*. Return of Orders in Council which have been published in the *Canada Gazette* and in the British Columbia *Gazette*, between 11th April, 1914, and 10th December, 1914, in accordance with provisions of Subsection (*d*) of Section 38 of the regulations for the survey, administration, disposal and management of Dominion Lands within the 40-mile railway belt in the province of British Columbia. Presented by Hon. Mr. Roche, 12th March, 1915.. .. .. .

CONTENTS OF VOLUME 28—*Continued.*

139a. Return to an Order of the House of the 24th February, 1915, for a copy of all letters, papers and documents relating to the dismissal of the following officers in Shelburne County, N.S.: Wm. L. Smith, lightkeeper, Baccaro, N.S.; J. A. Arechia, harbour master, Lower Wood Harbour, and J. C. Morrison, harbour master, Shelburne, N.S. Presented 16th March, 1915.—*Mr. Law*.. .. ..*Not printed.*

140. Return to an Order of the House of the 9th March, 1914, for a return showing:—1. The amounts of money expended by this Government in the county of Portneuf from the 1st of July, 1896, to the 21st September, 1911. 2. The nature of the work done in each parish. 3. In what year such work was executed, and what amount was expended in each case. Presented 4th March, 1915.—*Mr. Sevigny*.. .. ..*Not printed.*

141. Return to an Order of the House of the 22nd February, 1915, for a copy of all papers, petitions, declarations, affidavits, sworn statements, requests, certificates and all other documents in connection with the naturalization of F. P. Gutelius, General Manager of the Intercolonial Railway. Presented 4th March, 1915.—*Mr. Gauvreau*.. ..*Not printed.*

142. Report of the delegates appointed to represent the Government of Canada at the Eighth International Purity Congress, held under the auspices of the World's Purity League, at Kansas City, Mo., November 5th-9th, 1914. Presented by Sir Robert Borden, 4th March, 1915. *Not printed.*

143. Return to an Address to His Royal Highness the Governor General of the 22nd February, 1915, for a copy of all complaints to the Government of the killing of one American citizen and the shooting of another by militia men, in the waters of Lake Erie, and of all correspondence with regard to the same with the British Embassy and American authorities. Presented 5th March, 1915.—*Sir Wilfrid Laurier*.. .. .. ..*Not printed.*

144. Return to an Order of the House of the 24th February, 1915, for a return showing the amounts in detail paid to Ward Fisher, of Shelburne, N.S., fishery inspector, for the years 1912 and 1913, for salary, office expenses, travelling expenses, and all other expenses. Presented 5th March, 1915.—*Mr. Law*.. .. ..*Not printed.*

145. Return to an Order of the House of the 15th February, 1915, for a return showing the names and addresses of all persons in Yarmouth County to whom the bounty under the Fenian Raid Volunteer Bounty Act has been paid; the names and addresses of all persons from said county whose applications have been rejected, and a list giving names and addresses of all applicants from said county whose applications have not yet been disposed of. Presented 5th March, 1915.—*Mr. Law*.. .. ..*Not printed.*

146. Return to an Order of the House of the 19th February, 1915, for a return showing the names and post office addresses of all persons in Guysborough County, N.S., to whom the bounty under the Fenian Raid Volunteer Bounty Act has been paid; the names and post office addresses of all persons whose applications have been rejected, and the reason for such rejections; also the names and post office addresses of all persons whose applications have been received but have not yet been paid, distinguishing between those who have been dealt with and allowed, and such applications as have been received but not yet considered, if any. Presented 5th March, 1915.—*Mr. Sinclair.* *Not printed.*

147. Return to an Order of the House, of the 12th February, 1915, for a return showing:—1. How many applications for seed grain have been received from residents of the three prairie provinces since June, 1914? 2. How many bushels of grain were included in the applications? 3. How many acres of land were to be seeded by the grain applied for? 4. How many bushels of wheat, oats and barley, respectively, the Government has on hand with which to meet the applications? 5. If arrangements have been made under which the several Provincial Governments will assist in meeting the needs of the settlers for seed grain? Presented 8th March, 1915.—*Mr. McCraney*.. ..*Not printed.*

148. Return to an Order of the House, of the 2nd February, 1914, for a return showing the number of ships chartered by the Government or any department thereof since October, 1911, to go to Hudson's Bay or James Bay; the name of each and the tonnage; the name and residence of each commanding officer; what cargo each carried, and what portion was landed, and where, what was lost and where, and what returned; with the values in each case. Presented 8th March, 1915.—*Mr. Graham*.. .. .. ..*Not printed.*

148a. Return to an Order of the House of the 3rd March, 1915, for a return showing the number of ships employed by the Railway Department, the number of men hired on vessels and on shore, and the amount expended for supplies, men and transportation from 31st March, 1914, to 31st December, 1914, in connection with the Hudson Bay Railway expenditures. Presented 22nd March, 1915.—*Mr. Macdonald*..*Not printed.*

149. Return to an Address to His Royal Highness the Governor General, of the 9th February, 1914, for a copy of all correspondence since the 1st January last with regard to the calling of an Imperial Conference on the subject of naval defence. Presented 8th March, 1915.—*Sir Wilfrid Laurier*.. .. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

150. Return to an Order of the House, of the 11th February, 1915, for a return showing the names and addresses of all persons in Antigonish County to whom the bounty under the Fenian Raid Volunteer Bounty Act has been paid; the names and addresses of all persons from said county whose applications have been rejected, and a list giving names and addresses of all applications from said county whose applications have not yet been disposed of. Presented 8th March, 1915.—*Mr. Chisholm (Antigonish).*
Not printed.

151. Return to an Order of the House, of the 3rd March, 1915, for a return showing:—1. Who were the different officers commissioned to the 17th Nova Scotia Regiment at Valcartier before they sailed for England? 2. Who are now the commissioned officers of said regiment. Presented 8th March, 1915.—*Mr. Macdonald*.. .. ..*Not printed.*

152. Return to an Order of the House, of the 9th February, 1915, for a copy of all accounts of the transfer of the storm signal at Shippigan, N.B., from its former position on land to the public wharf, showing the total cost of said transfer during the months of October and November in 1911. Presented 8th March, 1915.—*Mr. Turgeon.*
Not printed.

153. Return to an Order of the House, of the 4th May, 1914, for a copy of all correspondence, telegrams, petitions, including the signatures of such petitions, and all other documents and papers in the possession of the Department of Trade and Commerce, or the minister of said department, or in the possession of the Prime Minister, relating to any application made between 1st November, 1913, and date hereof by parties in Nova Scotia asking for Government assistance towards the transportation of fresh fish between ports in Nova Scotia and the United States. Presented 9th March, 1915.—*Mr. Sinclair.*
Not printed.

154. Statement of Mr. H. C. Crowell, staff correspondent of the Halifax *Chronicle,* and correspondence in connection with statements appearing in the press referring to alleged ill-treatment of the 17th Regiment of Nova Scotia, at Salisbury Plains. Presented by Sir Robert Borden, 9th March, 1915.. .. ..*Not printed.*

155. Return to an Order of the House, of the 3rd March, 1915, for a return showing:—1. The estimated cost of fitting up the works of the Canadian Car and Foundry Company, Limited, at Amherst, N.S., for military purposes. 2. The rent or other remuneration being paid, or will be paid, this company for the use of its buildings. 3. Who are to supply the military provisions, including food for men, coal for heating and cooking, and food and other supplies for horses quartered on these premises, and at what prices. 4. Whether it is true that forms for tendering for such military supplies could only be obtained from the office of the sitting member for Cumberland County, and in several cases forms of tender were refused to applicants. 5. Whether the Government is aware that in the case of the supplying of hay, as alleged, not only Liberals were not allowed to tender for same, but supporters of the Government were informed they would not secure any part of the contract, if any of the hay to be supplied was to be purchased from a Liberal. Presented 11th March, 1915.—*Mr. Copp*.. .. .. ..*Not printed.*

156. Return to an Address to His Royal Highness the Governor General, of the 1st March, 1915, for a copy of all correspondence of the Imperial authorities on the subject of loans from the Imperial Treasury to the Canadian Government. Presented 11th March, 1915.—*Mr. Maclean (Halifax)*.. .. ..*Not printed.*

157. Return to an Order of the House of the 3rd March, 1915, for a copy of all correspondence, recommendations, letters and telegrams relating to the appointment of H. W. Ingraham as Assistant Registrar of Alien Enemies at Sdyney, N.S., and to his dismissal from the said office. Presented 12th March, 1915.—*Mr. Kyte*.. .. ..*Not printed.*

158. Return to an Address to His Royal Highness the Governor General of the 11th February, 1915, for a copy of all correspondence relating to the purchase of, and payment by the Government for two submarines authorized by Order in Council dated the 7th August, 1914, and of any other Order or Orders in Council relating thereto; and also of all reports received by the Government or any department thereof referring to said submarines. Presented 12th March, 1915.—*Mr. Pugsley* .. ..*Printed for distribution only.*

158*a*. Supplementary Return to an Address to His Royal Highness the Governor General, of the 11th February, 1915, for a copy of all correspondence relating to the purchase of, and payment by the Government for two submarines authorized by Order in Council dated the 7th August, 1914, and of any other Order or Orders in Council relating thereto; and also of all reports received by the Government or any department thereof referring to said submarines. Presented 15th March, 1915.—*Mr. Pugsley.*
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CONTENTS OF VOLUME 28—*Continued.*

158*b*. Further Supplementary Return to an Address to His Royal Highness the Governor General, of the 11th February, 1915, for a copy of all correspondence relating to the purchase of, and payment by the Government for two submarines authorized by Order in Council dated the 7th August, 1914, and of any other Order or Orders in Council relating thereto; and also of all reports received by the Government, or any department thereof, referring to said submarines. Presented 24th March, 1915.—*Mr. Pugsley.*
Printed for distribution only.

159. Return to an Order of the House of the 19th February, 1915, for a copy of all correspondence, telegrams, petitions, letters and all other documents in any way referring to the dismissal of Mr. Mallet, captain of the life-boat in the life-saving station at Cheticamp, and the appointment of his successor. Presented 12th March, 1915.—*Mr. Chisholm (Antigonish)* . . . . . *Not printed.*

160. Return to an Order of the House of the 3rd March, 1915, for a copy of all letters, papers and other documents relating to the discharge of Dr. John McKenzie as medical doctor to the Indians of Pictou County, and to the appointment of Dr. Keith as his successor. Presented 12th March, 1915.—*Mr. Macdonald*. . . . . *Not printed.*

161. Return to an Order of the House of the 15th February, 1915, for a copy of all correspondence, letters, telegrams, instructions, reports and other documents relating to an application by Udo F. Schrader for a grazing lease in townships 40 and 41, range 7, west of the 3rd meridian, province of Saskatchewan. Presented 12th March, 1915.—*Mr. McCraney*. . . . . *Not printed.*

162. Return to an Order of the House of the 3rd March, 1915, for a return showing the names of all applicants for Fenian Raid Bounty in the county of Pictou who have not yet been paid their bounty. Presented 15th March, 1915.—*Mr. Macdonald*. . . *Not printed.*

162*a*. Return to an Order of the House of the 19th February, 1915, for a return showing the names and addresses of all persons in the county of Pictou who have been paid the Fenian Raid Bounty, and of all persons in said county who have made application for said bounty, and who have not yet received it. Presented 15th March, 1915.—*Mr. Macdonald*. . . . . *Not printed.*

163. Return to an Order of the House of the 4th March, 1915, for a return showing:—1. From whom food for men and horses, and all other supplies and equipment for the Field Battery now being trained at Lethbridge, is bought? 2. If by tender, the date tenders were called for? 3. When tenders were opened and contracts awarded? 4. The names and post office addresses of all parties who submitted tenders? 5. The successful tenderers, and the price in each case. Presented 15th March, 1915.—*Mr. Buchanan*. . . . . *Not printed.*

164. Return to an Order of the House, of the 1st March, 1915, for a copy of all petitions, reports, recommendations, letters, telegrams and correspondence relating to the dredging of Antigonish Harbour and the opening or improving of the entrance thereto, received by the Government, or any department thereof, since the 1st January, 1912, and not already included in the return presented the 30th of April, 1914, in obedience to the Order of the House passed the 16th March, previously. Presented 15th March, 1915.—*Mr. Chisholm (Antigonish)*. . . . . *Not printed.*

165. Copy of Order in Council dated 9th March, 1915, restricting the transfer of British ships. Presented by Hon. Mr. Hazen, 16th March, 1915. . . . . *Not printed.*

166. Report of the Commissioners appointed to investigate and report upon the water levels of the River St. Lawrence at and below Montreal, together with a brief summary prepared by the Chief Hydrographer of the Survey. Presented by Hon. Mr. Hazen, 16th March, 1915. . . . . *Not printed.*

167. Return to an Order of the House of the 3rd March, 1915, for a copy of all letters, telegrams, papers and other documents relating to the mail contract between Chance Harbour and Trenton, Pictou County, in regard to the existing contract. Presented 18th March, 1915.—*Mr. Macdonald*. . . . . *Not printed.*

168. Return to an Order of the House of the 19th February, 1915, for a copy of all correspondence and other documents relating to the awarding of the mail contract at Maria Capes, Bonaventure County, in 1914. Presented 15th March, 1915.—*Mr. Marcil*
Not printed.

169. Return to an Order of the House of the 15th February, 1915, for a copy of all tenders letters and telegrams, including first and second call for tenders, for rural mail delivery in the township of Dundee, county of Huntingdon. Presented 18th March, 1915.—*Mr. Robb*. . . . . *Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

170. Return to an Order of the House of the 11th February, 1915, for a copy of all petitions, letters, telegrams and correspondence regarding a proposed daily mail service between Lower South River and South Side Harbour, Antigonish County, and improved postal accommodation for the residents of the last-named district. Presented 17th March, 1915.—*Mr. Chisholm (Antigonish)*.. .. ..*Not printed.*

171. Return to an Order of the House of the 1st March, 1915, for a copy of all letters, documents, telegrams, recommendations, petitions and other papers received by the Post Office Department since 1st January, 1914, relating to the contract for carrying the mails between Guysborough and Canso, N.S. Presented 18th March, 1915.—*Mr. Sinclair*.. .. ..*Not printed.*

172. Return to an Order of the House of the 22nd February, 1915, for a return showing:1. The total number of employees, both permanent and temporary, at the following post offices: Montreal, Toronto, Winnipeg, Halifax, Quebec, St. John, N.B., and Vancouver. 2. The total amount of salaries paid in each case. 3. The total number of employees, and the amount of salaries paid in the above offices on the 1st of October, 1911. Presented 18th March, 1915.—*Mr. Lemieux*.. .. ..*Not printed.*

173. Return to an Order of the House of the 19th February, 1915, for a copy of all correspondence, telegrams, letters, petitions and documents of all kinds in any way referring to a proposed change in the mail route from Inverness railway station to Margaree Harbour. Presented 18th March, 1915.—*Mr. Chisholm (Inverness)*.. ..*Not printed.*

174. Return to an Order of the House of the 8th March, 1915, for a return showing:—1. From how many firms or individuals the Government, or any department thereof, has ordered soldiers uniforms since the 1st of July, 1914. 2. The names of these firms. 3. How many Oliver equipments have been ordered from each firm. 4. How many of these uniforms each firm has delivered up to date. 5. How many each firm has yet to deliver. 6. The price each firm is receiving for these uniforms. Presented 18th March, 1915.—*Mr. Murphy*.. .. ..*Not printed.*

175. Return to an Order of the House of the 8th March, 1915, for a return showing:—1. From how many firms or individuals the Government, or any department thereof, has ordered Oliver equipments since the 1st of July, 1914? 2. The names of these firms? 3. How many Oliver equipments have been ordered from each firm? 4. How many each firm has delivered up to date? 5. How many each firm has yet to deliver? 6. The price each firm is receiving for these Oliver equipments? Presented 18th March, 1915.—*Mr. Murphy*.. .. ..*Not printed.*

176. Return to an Order of the House of the 11th March, 1915, for a copy of all letters, correspondence, etc., relating to the appointment of William Gore Foster, of Dartmouth, N.S., to the position of Inspector of Indian Reserves. Presented 18th March, 1915.—*Mr. Carroll*.. .. ..*Not printed.*

177. Return to an Order of the House of the 15th February, 1915, for a copy of all letters, telegrams, correspondence, leases, and other documents relating to the cutting of lumber by Mr. B. F. Smith, and others, from the so-called Tobique Indian Reserve in the province of New Brunswick since the twelfth day of March, A.D. 1914, and also of all agreements, offers and promises made either by the said B. F. Smith or the Department of Indian Affairs, with reference to the sale or disposal of any of the said Tobique Indian Reserve since the said date, or any logs or lumber cut thereon. 2. Also a statement of all lumber cut by the said B. F. Smith from the said reserve, the rates of stumpage charged, and the amounts actually paid thereon from the first day of January, 1912, down to the date hereof. Presented 18th March, 1915.—*Mr. Carvell.*
Not printed.

178. Return to an Order of the House of the 8th March, 1915, for a return showing:—1. The number of customs officers employed at the customs port of Masonville, Quebec, on 20th September, 1911. 2. The names of these officers. 3. The salary each one received. 4. The total amount of salaries paid the officers at this port. 5. The number of customs officers employed at the port of Masonville at the present time. 6. The names of these officers. 7. The salary each one receives. 8. The total amount of salaries paid to the officers at this port. Presented 18th March, 1915.—*Mr. Kay*... ..*Not printed.*

179. Return to an Order of the House of the 8th March, 1915, for a return showing:—1. The number of customs officers employed at the customs port of Highwater, Quebec, on 20th September, 1911. 2. The names of these officers. 3. The salary each one received. 4. The total amount of salaries paid the officers at this port. 5. The number of customs officers employed at the port of Highwater at the present time. 6. The names of these officers. 7. The salary each one receives. 8. The total amount of salaries paid to the officers at this port. Presented 18th March, 1915.—*Mr. Kay*... ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

180. Return to an Order of the House of the 8th March, 1915, for a return showing:—1. The number of customs officers employed at the customs port of Abercorn, Quebec, on 20th September, 1911. 2. The names of these officers. 3. The salary each one received. 4. The total amount of salaries paid the officers at this port. 5. The number of customs officers employed at the port of Abercorn at the present time. 6. The names of these officers. 7. The salary each one receives. 8. The total amount of salaries paid to the officers at this port. Presented 18th March, 1915.—*Mr. Kay*. . . . . *Not printed.*

181. Return to an Order of the House, of the 1st March, 1915, for a copy of all petitions, letters, communications and other documents relating to or bearing upon the dismissal of Leonard Hutchinson, chief keeper at Dorchester penintentiary. Presented 18th March, 1915.—*Mr. Copp*. . . . . *Not printed.*

182. Return to an Order of the House of the 22nd February, 1915, for a copy of all letters, telegrams and papers generally concerning the proposed construction of a bridge to connect Isle Perrot with the mainland at Vaudreuil. Presented 18th March, 1915.—*Mr. Boyer*. . . . . *Not printed.*

182a. Return to an Order of the House of the 22nd February, 1915, for a copy of all letters, telegrams and papers generally concerning the proposed construction of a bridge between the Island of Montreal and the Mainland at Vaudreuil. Presented 18th March, 1915.—*Mr. Boyer*. . . . . *Not printed.*

183. Return to an Order of the House of the 22nd February, 1915, for a return showing:—1. What properties have been acquired by the Government in the City of Regina since 21st September, 1911? 2. The descriptions of such properties by metes and bounds? 3. For what purposes such properties were acquired? 4. From whom such properties were purchased? 5. The total price and the price per foot paid for each property? 6. If any such property was acquired by expropriation, what tribunal determined the price to be paid for any property so expropriated? 7. The dates on which any such properties were acquired? Presented 18th March, 1915.—*Mr. Martin (Regina)*.

184. Return to an Order of the House of the 19th February, 1915, for a copy of all letters, telegrams, memoranda, pay-lists, recommendations and any other documents whatsoever in any wise appertaining to the construction of a wharf at Lower Burlington, in the County of Hants. Presented 18th March, 1915.—*Mr. Chisholm (Inverness)*. *Not printed.*

185. Return to an Order of the House of the 24th February, 1915, for a copy of pay-rolls and all correspondence and vouchers in connection with the repairs to Jordan breakwater, Shelburne county, for which Leander McKenzie was contractor of works or foreman. Presented 18th March, 1915.—*Mr. Law* . . . . . *Not printed.*

186. Return to an Order of the House of the 24th February, 1915, for a copy of all letters, telegrams, correspondence and pay-rolls in connection with repairs and extension of breakwater at Bluff Head, Yarmouth county, N.S., during year 1914. Presented 18th March, 1915.—*Mr. Law*. . . . . *Not printed.*

187. Return to an Order of the House of the 22nd February, 1915, for a return showing the amounts expended by the Public Works Department in the County of Inverness each year from 1896 down to 1915. Presented 18th March, 1915.—*Mr. Chisholm (Inverness)*. . . . . *Not printed.*

188. Return to an Order of the House of the 24th February, 1915, for a copy of all letters, telegrams, correspondence and pay-sheets in connection with the repairs and other work on the breakwater at Sandford, Yarmouth County, N.S., during the year 1914. Presented 18th March, 1915.—*Mr. Law*. . . . . *Not printed.*

189. Return to an Order of the House of the 1st March, 1915, for a copy of all papers, letters, petitions and other documents relating to a mail contract with David D. Heard & Sons, between Whitby and Grand Trunk Railway station, or with one John Gimblet, Whitby. Presented 19th March, 1915.—*Mr. Pardee*. . . . . *Not printed.*

190. Copies of Reports of the Committee of the Privy Council, approved by His Royal Highness the Governor General, relating to certain advances made to the Canadian Northern Railway Company and the Grand Trunk Pacific Railway Company, respectively, together with copies of agreements made between the said companies and His Majesty. Presented by Hon. Mr. White, 19th March, 1915. . . . . *Not printed.*

191. Return to an Order of the House of the 11th February, 1915, for a copy of all tenders received by the Post Office Department for the mail service between Caraquet and Tracadie, Gloucester County, N.B., on the 15th day of January last, with the names of the tenderers, the respective amounts of the tenders, and the name of the new contractor. Presented 19th March, 1915.—*Mr. Turgeon*. . . . . *Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

192. Return to an Order of the House of the 8th March, 1915, for a return showing:—1. The fractional areas of homestead lands or otherwise in the province of Saskatchewan sold in the year 1914. 2. The name of the purchaser, and the price paid in each case. Presented 22nd March, 1915.—*Mr. Martin (Regina)*.. .. ..*Not printed.*

193. Return to an Order of the House of the 25th February, 1915, for a return showing, in reference to the answer to question No. 6 of 9th February, and answered 15th February as per page 161 unrevised *Hansard*, the cost of furnishing the Government offices in each of the said buildings. Presented 22nd March, 1915.—*Mr. Turriff.*
Not printed.

194. Return to an Order of the House of the 1st March, 1915, for a return showing the amount of railway subsidies paid in the county of Inverness since 1896, to date, and the dates on which such subsidies were paid. Presented 22nd March, 1915.—*Mr. Chisholm (Inverness)*.. .. ..*Not printed.*

195. Return to an Order of the House of the 1st March, 1915, for a copy of all letters, papers, telegrams and other documents relating to the purchase or lease of the railway from New Glasgow to Thorburn, in the county of Pictou, known as the Vale Railway, from the Acadia Coal Company, since January, 1911, to date. Presented 22nd March, 1915. —*Mr. Macdonald*.. .. ..*Not printed.*

196. Return to an Order of the House of the 1st March, 1915, for a copy of all papers, letters, telegrams, correspondence, contracts, etc., in connection with the sale of the hay grown or the lease of certain tracts of land belonging to the Intercolonial Railway, upon which hay is grown, and which are contiguous to the properties of Charles Lavoie, Cléophas Leclerc and Joseph Parent of the Parish of Bic, county of Rimouski. Presented 22nd March, 1915.—*Mr. Lapointe (Kamouraska)*.. .. ..*Not printed.*

197. Return to an Order of the House of the 3rd March, 1915, for a copy of all letters, papers, telegrams, evidence taken at investigations, reports and all other documents relating to the suspension or other action in regard to the charge of drunkeness against Newton Hopper, conductor on the Intercolonial Railway, and to his subsequent reinstatement. Presented 22nd March, 1915.—*Mr. Macdonald*.. .. ..*Not printed.*

198. Return to an Order of the House of the 1st March, 1915, for a copy of all letters, telegrams and other papers relating to the dismissal of Bruce Wiswell, as sectionman on the Intercolonial Railway at Stellarton, Nova Scotia. Presented 22nd March, 1915.— *Mr. Macdonald*.. .. ..*Not printed.*

199. Return to an Order of the House of the 22nd February, 1915, for a return showing:— 1. The inward tonnage freight, and also the outward tonnage freight respectively, at Loggieville station of the Intercolonial Railway for each month of 1914, and also for the month of January, 1915. 2. The inward tonnage freight, and the outward tonnage freight at Chatham station, on the Intercolonial Railway for each month of 1914, and also for the month of January, 1915. 3. The inward tonnage freight, and the outward tonnage freight at Newcastle station on the Intercolonial Railway for each month of 1914, and also for the month of January, 1915. 4. The local and through passenger traffic to and through each of the above stations, respectively, during each of the months above mentioned. Presented 22nd March, 1915.—*Mr. Loggie.*
Not printed

200. Return to an Order of the House of the 15th February, 1915, for a copy of all letters, telegrams and correspondence had by Margaret Lynch, or any person representing her, with reference to the expropriation of certain land beolnging to the said Margaret Lynch in the city of Fredericton, province of New Brunswick, by the Intercolonial Railway, and also of all letters, telegrams and correspondence had with F. P. Gutelius or any other official of the Intercolonial Railway with reference thereto. Presented 22nd March, 1915.—*Mr. Carvell*.. .. ..*Not printed.*

201. Return to an Order of the House of the 3rd March, 1915, for a copy of all documents bearing on the payment made to C. R. Scoles, New Carlisle, Quebec, in July, 1914, of balance of subsidy voted to the Atlantic and Lake Superior Railway on the recommendation of the Financial Comptroller. Presented 22nd March, 1915.—*Mr. Marcil.*
Not printed.

202. Return to an Order of the House of the 1st March, 1915, for a copy of all letters, telegrams, correspondence and reports relating to the purchase of the New Brunswick and Prince Edward Island Railway, extending from Sackville to Cape Tormentine, county of Westmorland. Presented 22nd March, 1915.—*Mr. Copp*.. .. ..*Not printed.*

203. Return to an Order of the House of the 1st March, 1915, for a copy of the tariff on flour shipments now in force on the Quebec, Oriental Railway and the Atlantic, Quebec and Western Railway. Presented 22nd March, 1915.—*Mr. Marcil*.. .. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

204. Return to an Order of the House of the 22nd February, 1915, for a copy of all petitions, correspondence, complaints, reports and other documents relating to the dismissal of Alfred H. Bonnyman, postmaster of Mattatall Lake, in the county of Colchester, N.S. Presented 24th March, 1915.—*Mr. Sinclair*.. .. ..*Not printed.*

205. Return to an Address to His Royal Highness the Governor General, of the 1st March, 1915, for a copy of all correspondence, documents, charges, evidence, findings and Orders in Council in reference to the dismissal of John Thomas, postmaster at Hammonds Plain, Halifax County, N.S. Presented 24th March, 1915.—*Mr. Maclean (Halifax)*.. .. ..

CONTENTS OF VOLUME 28—*Continued.*

216. Return to an Order of the House of the 24th February, 1915, for a copy of all pay-rolls, vouchers in detail, correspondence and all other documents in connection with the following public wharves in Shelburne; breakwater or wharf at East Green Harbour; shed on public wharf at Shelburne, and repairs to Gunning Cove wharf. Presented 1st April, 1915.—*Mr. Law*.. .. .. .

CONTENTS OF VOLUME 28—*Continued.*

228. Return to an Address to His Royal Highness the Governor General of the 19th February, 1915, for a copy of all Orders in Council, letters and telegrams exchanged between the Dominion Government and the several provinces, concerning the proposed transfer of fisheries in tidal waters from the Provincial to the Federal control. Presented 1st April, 1915.—*Mr Lemieux*. . . . . *Not printed.*

229. Return to an Order of the House of the 4th March, 1915, for a copy of all correspondence exchanged between the Government of Canada, or any minister or official thereof, in regard to the control of fisheries in Quebec province, as well as of all documents bearing on that question, together with a list of licenses granted by either Governments for the present year. Presented 1st April, 1915.—*Mr. Marcil*. . . . . *Not printed.*

230. Return to an Order of the House of the 24th February, 1915, for a copy of all correspondence, letters, telegrams and petitions relating to the appointment of Alfred Bishop as farm foreman, or in any other capacity at the experimental station at Kentville, Nova Scotia. Presented 1st April, 1915.—*Mr. Kyte*. . . . . *Not printed.*

231. Return to an Address of the 10th March, 1915, showing copies of all correspondence, telegrams and documents exchanged between the Department of Marine and Fisheries and the Minister of the Naval Service and the Department of Colonization, Mines and Fisheries of the province of Quebec, relating to the rescinding of the prohibition of net fishing in the waters of the Lakes of Two Mountains, St. Francis and St. Louis, as per Order in Council (197) passed in Ottawa, Thursday, 28th day of January, 1915.—*Senate*). . . . . *Not printed.*

232. Return to an Order of the House of the 1st March, 1915, for a copy of all papers, letters, petitions and other documents relating to the establishment of a rural mail route from River John to Hedgeville, county of Pictou. Presented 3rd April, 1915.—*Mr. Macdonald.* *Not printed.*

233. A communication from the Consul General of Belgium in Canada, respecting the protest of the Belgium Government against the contention of the German Chancery that as far back as in 1906, Belgium had broken her own neutrality by the conclusion of an agreement with Great Britain. Presented by Sir Robert Borden, 5th April, 1915. *Printed for sessional papers.*

234. Return to an Address of the Senate dated 11th March, 1915, showing:—1. How much wheat, oats and barley has the Dominion Government purchased in 1914 for seed to be distributed in the West, giving the amount of each kind? 2. Where is said grain stored, and what rate of storage is the Government paying on same? 3. How much did the Government pay per bushel for oats, barley and wheat, purchased for said provinces, and when was said grain purchased? 4. Have they given a contract for cleaning said grain, and to whom, and at what price?—(*Senate*). . . . . *Not printed.*

235. Return to an Order of the Senate dated the 18th March, 1915, that an Order of the Senate do issue for:—1. A return showing the results per grade of all grain in each of the terminal elevators at Fort William and Port Arthur at the annual weigh-up for each of the years 1912, 1913 and 1914. 2. A return showing the balances whether overages or shortages in each grade in each elevator for each of the said years. 3. A return showing the net result of the three years operations of each of said elevators in overages or shortages in each grade.—(*Senate*). . . . . *Not printed.*

236. Return to an Order of the House of the 8th March, 1915, for a return showing:—1. The quantity of spirituous liquors, proof gallons, including ale, wines and beers, taken out of bond between 6th August and 21st August, 1914, at each port of the Dominion. 2. The quantity of cigars, cigarettes and tobacco taken out of bond between the above mentioned dates at each port of the Dominion. Presented 7th April, 1915.—*Mr. Hughes (Kings, P.E.I.)*. . . . . *Not printed.*

237. Return to an Order of the House of the 8th March, 1915, for a return showing:—1. From how many firms or private individuals the Government, or any department of the Government, has ordered forage caps since the 1st of July, 1914? 2. The names of these firms? 3. How many forage caps have been ordered from each firm? 4. How many each firm has delivered to date? 5. How many each firm has yet to deliver? 6. The price each firm is receiving for these forage caps? Presented 7th April, 1915.—*Mr. Murphy*. . . . . *Not printed.*

238. Return to an Order of the House of the 11th March, 1915, for a copy of the report of Dr. Wm. Wakeham, on the extent of the losses sustained in the Baie des Chaleurs and Gulf of St. Lawrence in the storm of 5th June, 1914, together with a statement showing the number of claims received and those entertained, with names of claimants and their residence, and the amounts paid to each, together with a copy of other documents bearing on this question. Presented 7th April, 1915.—*Mr. Marcil*. . . . . *Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

239. Return to an Address to His Royal Highness the Governor General, of the 23rd February, 1915, for a copy of all letters, telegrams, reports, recommendations, Orders in Council and all other documents and papers in connection with rewards to the officers and crews of steamers *John L. Cann* and *Westport III,* for their heroic efforts in saving the passengers and crews of ss. *Cobequid,* wrecked on Trinity Lodge, 13th January, 1914. Presented 7th April, 1915.—*Mr. Law*.. .. ..*Not printed.*

240. Return to an Order of the House of the 29th March, 1915, for a copy of all documents, letters, telegrams, reports, etc., relating to the dismissal of Alexandre Blais, of the city of Lévis, from the position of customs officer at Bradore Bay, and the appointment of his successor or successors. Presented 7th April, 1915.—*Mr. Bourassa*.. ..*Not printed.*

241. A Return to an Address of the Senate dated 18th March, 1915, for:—1. A return showing all appointments to the Civil Service, Department of the Interior, in that area contained in the present constituencies of Medicine Hat and Macleod, giving names, date of appointment, how appointed, and salaries from the year 1896 to the present date. 2. Also, all vacancies by death, resignation or dismissal, giving name, date, length of service and cause of dismissal in the same area and during the same period.—(*Senate*). *Not printed.*

242. Return to an Order of the House of the 1st March, 1915, for a copy of charges made against J. Herbert Sweetman, customs officer at Port Daniel Centre, Quebec, which brought about his dismissal; and also of charges against Velson Horie, lighthouse keeper at Port Daniel West, Quebec, which brought about his dismissal. Presented 8th April, 1915.—*Mr. Marcil (Bonaventure)*.. .. .. *Not printed.*

243. Return to an Order of the House of the 22nd February, 1915, for a copy of all correspondence, recommendations, petitions, contracts, tenders and other papers and documents in any way connected with the letting of the contract for carrying the mails between Guysborough and Erinville, N.S. Presented 8th April, 1915.—*Mr. Sinclair.* *Not printed.*

244. Return to an Order of the House of the 10th March, 1915, for a copy of all reports, petitions, letters, telegrams and other documents in connection with the dismissal of W. M. Thomson from the postmastership at Fort Qu'Appelle, and of any petition or petitions for his reinstatement, and of all correspondence in connection therewith. Presented 8th April, 1915.—*Mr. Thomson (Qu'Appelle)*.. .. ..*Not printed.*

245. Return to an Order of the House of the 22nd March, 1915, for a copy of all letters, telegrams, correspondence and petitions received in the Post Office Department, in any way referring to the calling of tenders for the Antigonish-Sherbrooke mail service, which tenders were opened or due at the Post Office Department on the 11th December last; and of all representations or requests, recommending or suggesting that new tenders should be invited as was done early in February last. Presented 8th April, 1915. —*Mr. Chisholm (Inverness)*... .. ..*Not printed.*

246. Return to an Order of the House of the 3rd March, 1915, for a copy of all letters, telegrams, papers and other documents in regard to a proposed rural mail delivery service between Pictou and Saltsprings, Pictou county, and as to the arrangements for the existing service between those points. Presented 8th April, 1915.—*Mr. Macdonald.* *Not printed.*

247. Return to an Address of His Royal Highness the Governor General, of the 1st March, 1915, for a copy of all letters, telegrams, reports, recommendations, Orders in Council, and all other documents and papers whatsoever relating to or in any wise connected with the establishment of rural mail routes and deliveries from Bridgetown to Granville Ferry, county of Annapolis, and especially of all letters, telegrams, reports, recommendations and documents relating to the closing of the post offices at Belleisle, Upper Granville, and the establishment of the post office at Granville Centre, all in the county of Annapolis. Presented 8th April, 1915.—*Mr. Macdonald*.. .. ..*Not printed.*

248. Return to an Order of the House of the 22nd February, 1915, for a copy of all telegrams, letters, reports, petitions and all other documents in any way referring to the proposed line of railway from Orangedale to Cheticamp. Presented 9th April, 1915.—*Mr. Chisholm (Inverness)*.. .. ..*Not printed.*

249. Return to an Order of the House of the 11th March, 1915, for a copy of all documents, investigations, reports, correspondence, etc., relating to the burning of certain buildings belonging to the Trois Pistoles Pulp and Lumber Company and to André Leblond, near Tobin station, on the Intercolonial Railway. Presented 9th April, 1915.—*Mr. Lapointe (Kamouraska)*.. .. ..*Not printed.*

250. Return to an Order of the House of the 18th March, 1915, for a return showing the names of all officials, assistants and clerks, employed in the railway offices at Moncton, N.B., and the salary paid to each; also the names of officials formerly employed in said offices who have been retired on superannuation allowance, and the amount of retiring allowance being paid to each. Presented 9th April, 1915.—*Mr. Copp*.. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

251. Return to an Order of the House of the 24th March, 1915, for a return showing the names of all persons from whom lands have been purchased, the quantity of land so acquired, and the amount paid therefor, in connection with the Dartmouth and Dean's Post Office Branch of the Intercolonial Railway since the date of return numbered 128 made to Parliament at the last regular session thereof. Presented 9th April, 1915.—*Mr. Maclean (Halifax)* . . . . . *Not printed.*

252. Return to an Address to His Royal Highness the Governor General of the 17th March, 1915, for a copy of all correspondence, letters, Orders in Council, agreements, etc., in reference to the leasing or transfer of the Windsor Branch of the Intercolonial Railway to the Canadian Pacific Railway. Presented 9th April, 1915.—*Mr. Maclean (Halifax).* *Not printed.*

253. Return to an Order of the House of the 22nd February, 1915, for a copy of all petitions, correspondence, reports of engineers or other persons in the possession of the Department of Railways and Canals relating to the construction of a railway in the county of Guysborough, N.S. Presented 9th April, 1915.—*Mr. Sinclair* . . . . . *Not printed.*

254. Return to an Order of the House of the 10th March, 1915, for a copy of all letters and correspondence, between D. McDonald, superintendent of the Intercolonial, at Lévis, P. Brady, general superintendent at Moncton, or any other official of the said Intercolonial Railway and Théophile Bélanger, commercial traveller of the city of Montreal, concerning certain claims made by the said Théophile Bélanger for delay of baggage in transportation between Drummondville and Matapedia, in May, 1913, also all reports made bearing upon such claims against the said Intercolonial Railway. Presented 9th April, 1915.—*Mr. Ethier* . . . . . *Not printed.*

255. Return to an Order of the House of the 15th February, 1915, for a copy of all letters, telegrams, minutes of investigation and other documents relating to the dismissal of Isaac Arbuckle, foreman carpenter Intercolonial Railway at Pictou, and of appointment of Alex. Talbot to the vacancy. Presented 9th April, 1915.—*Mr. Macdonald.* *Not printed.*

256. Return to an Order of the House of the 15th February, 1915, for a copy of all correspondence letters, telegrams, by any and all persons whomsoever, had with the Department of Railways and Canals, or F. P. Gutelius, general manager of the Intrcolonial Railway, or any other official thereof, with reference to freight rates over that portion of the Transcontinental Railway, province of New Brunswick, and also with reference to the removal of the Y connection at Wapski, county of Victoria, between the said Transcontinental Railway and the Canadian Pacific Railway at that point. Presented 9th April, 1915.—*Mr. Carvell* . . . . . *Not printed.*

257. Return to an Order of the House of the 15th February, 1915, for a copy of all letters, telegrams, correspondence, contracts, and other documents relating to the operation of the St. John Valley Railway, so called, by the Intercolonial Railway, since the first day of July last past, and of all letters, correspondence, etc., had either with the Department of Railways and Canals, or with F. P. Gutelius, or any other official of the Intercolonial Railway. Presented 9th April, 1915.—*Mr. Carvell* . . . . . *Not printed.*

258. Return to an Order of the House of the 1st March, 1915, for a copy of all petitions, memorials, letters, telegrams, communications and reports regarding the construction of a roadway to the new public wharf at Sackville, N.B., and also in regard to the building of a spur line or siding from the Intercolonial Railway at Sackville to said wharf. Presented 9th April, 1915.—*Mr. Copp* . . . . . *Not printed.*

259. Return to an Order of the House of the 15th March, 1915, for a copy of all correspondence passing between any department of the Government and any official of the Government, or any other person, with respect to the placing of settlers on homesteads in the Duck Mountains Timber Reserve, and also of the evidence taken by Inspector Cuttle, of the Department of the Interior, in an investigation held by the said inspector with respect to the granting of entries for homesteads on the said timber reserve. Presented 9th April, 1915.—*Mr. Martin (Regina)* . . . . . *Not printed.*

260. Return to an Order of the House of the 8th March, 1915, for a return showing:—1. From how many firms or private individuals the Government, or any department of the Government, has ordered flannel shirts since the 1st of July, 1914? 2. The names of these firms? 3. How many flannel shirts have been ordered from each firm? 4. How many each firm has delivered up to date? 5. How many each firm has yet to deliver? 6. The price each firm is receiving for these flannel shirts? Presented 9th April, 1915.—*Mr. Carroll* . . . . . *Not printed.*

260a. Return to an Order of the House of the 8th March, 1915, for a return showing:—1. From how many firms or private individuals the Government, or any department of the Government, has ordered cotton shirts since the 1st of July, 1914? 2. The names of these firms? 3. How many cotton shirts have been ordered from each firm? 4. How many each firm has delivered up to date? 5. How many each firm has yet to deliver? 6. The price each firm is receiving for these cotton shirts? Presented 9th April, 1915. —*Mr. Cheetham (Antigonish)* . . . . . *Not printed.*

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260*b*. Return to an Order of the House of the 8th March, 1915, for a return showing:—1. From how many firms or private individuals the Government or any department of the Government, has ordered service shirts since the 1st of July, 1914? 2 The names of these firms? 3. How many service shirts have been ordered from each firm? 4. How many each firm has delivered up to date? 5. How many each firm has yet to deliver? 6. The price each firm is receiving for these service shirts? Presented 10th April, 1915.—*Mr. Carroll*.. .. .. .

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267. Return to an Order of the House of the 17th March, 1915, for a copy of all petitions, letters, documents, etc., between persons in the province of Nova Scotia and the Department of Trade and Commerce since 1st August last, with regard to Atlantic ocean freight rates on subsidized steamers or otherwise. Presented 10th April, 1915.—*Mr. Maclean (Halifax)*.. .. .. .

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278. Return to an Order of the House of the 8th April, 1915, for a return showing:—1. The number of employees connected with the administration of the Three Rivers post office on the 21st September, 1911, and the annual amount paid in salaries at that date for such service. 2. The number of employees connected with the administration of the Three Rivers post office at the present date, and the amount of the annual salaries paid for such service. 3. The number of employees in the Customs Department for Three Rivers on the 21st September, 1911, and the amount of the annual salaries paid for such service. 4. The number of employees in the Customs Department for Three Rivers at the present date, and the annual amount of the salaries paid for such service. 5. The number of employees in the Inland Revenue Department for the district of Three Rivers on the 21st September, 1911, and the annual amount of salaries paid for such service. 6. The number of employees at the present date in the Inland Revenue Department for the district of Three Rivers, and the amount of the annual salaries paid for such service. 7. The number of employees, and the amount paid in salaries for the works on the St. Maurice, in the county of Champlain, during the year 1911-12. 8. The number of employees, and the amount of salaries paid per year for the works on the St. Maurice, in the county of Champlain, since 1911-12. 9. If the employees whose names follow, were dismissed on the 26th and 27th November, 1914, and the 4th and 5th January, 1915; Wildé Lavalée, Pierre Thicierge, Joseph Paquin, sr., Joseph Paquin, jr., Athanase Gélinas, clerks. 10. If so, at whose request, and for what reasons. 11. If those days were taken off the salaries of such employees. Presented 13th April, 1915.—*Mr. Bureau*.. .. .. .

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289. Report and evidence upon the matter known as: "Grazing Ranch No. 2422, J. G. Turriff, A. J. Adamson, and J. D. McGregor." Presented by Hon. Mr. Coderre, 13th April, 1915.. .. .. .

DEPARTMENT OF AGRICULTURE

REPORT

OF THE

DAIRY AND COLD STORAGE COMMISSIONER

FOR THE

FISCAL YEAR ENDING MARCH 31

1914

DAIRYING, FRUIT, EXTENSION OF MARKETS AND COLD STORAGE

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
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1914

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REPORT

OF THE

DAIRY AND COLD STORAGE COMMISSIONER

To the Honourable
The Minister of Agriculture.

SIR,—I have the honour to submit my Annual Report for the year ended March 31, 1914, covering the work of the Branch with respect to Dairying, Fruit, Extension of Markets, and Cold Storage.

DAIRYING.

THE PROGRESS OF DAIRYING.

The dairying industry, taking the total production of milk as a basis of comparison, continues to expand in every province. The increase is due more to improvement in the cows than it is to an increase in the number thereof. The figures of the last census, with respect to dairy production, were published during the year. These figures show that the total number of cows in Canada in 1911 was 2,594,179, an increase of only 185,502 as compared with the census of 1901. The increase in the number of cows during the decade was only 7 per cent, but the total production of milk during the same period increased 43 per cent. In 1900* the average yield of milk was 2,850 pounds per cow. In 1910 the average yield had risen to 3,805 pounds. It would have required an increase of 1,054,894 cows to have equalled the production of 1910 at the average yield of 1900.

The total value of milk and its products in 1910 was $109,339,934, as compared with $66,470,953 in 1900. If we apply this rate of increase to the year 1913 it gives a total production of approximately $123,000,000.

The increase in the number of milch cows is confined to the four western provinces. The provinces of Alberta and Saskatchewan are showing the most rapid progress in dairy production. The combined value of the dairy production in these two provinces was only $1,276,050 in 1900 as against $15,421,758 in 1910. Every indication points to a large development of the dairying industry in the northwestern prairie country in the near future. The local market, including British Columbia, for which large quantities of dairy produce are now drawn from Eastern Canada

* The figures of production are always given for the year preceding that in which the census is taken.

and from New Zealand at high prices, offers every inducement for a large extension of the industry in that territory.

The creamery industry continues to increase in Nova Scotia. The first attempt at factory dairying in that province was made in 1870, in which year a cheese factory was started at Paradise in Annapolis county. Other cheese factories were started in the 80's but most of these early ventures failed after a struggling existence chiefly because the supply of milk within a reasonable distance from a given centre was not sufficient to give the necessary support. Separator creameries failed for the same reason.

The creamery at Scotsburn operated from 1900 to 1910 by this Branch has served to demonstrate the adaptability of the cream-gathering system for Nova Scotia conditions and, with it as an object lesson, a number of successful creameries have been started during recent years. There is every reason to believe that an extensive creamery business will soon be built up in that province, to the material advantage of the whole community.

The manufacture of cheese in Canada is declining. The total production may still be estimated from the export figures, inasmuch as the total home consumption of cheese has not, as in the case of other dairy products, been very greatly increased in late years. The maximum export of 233,980,716 pounds of cheese in 1904 has decreased to 144,478,340 pounds for the year ending March 31, 1914. The increased demand of the home market accounts for a part of the shrinkage, but the bulk of it is due to a smaller output. This falling off in cheese production is the result of milk being diverted to the milk condensing, milk powder factories and creameries and to supply the demand for milk and cream in the growing towns and cities.

The growth in the number of city creameries is quite a marked development of the last two or three years.

The Expanding Home Market.

In the year 1903-4 the export value of dairy products, which was then at its maximum, amounted to over 40 per cent of the total production. In 1913 less than 20 per cent was exported. A comparison of the census figures of 1901 and 1911, reducing everything to a milk basis, shows that the increase in production during that period, was 43 per cent, the increase in total home consumption was 74 per cent and the increase in per capita consumption was 30 per cent.

The increased demand for cream for table use and for the manufacture of ice cream, is a very important factor in the home trade, although no exact figures can be quoted as showing the increase in consumption on this account. The total consumption of butter in Canada increased by 59 per cent between 1901 and 1911, and the per capita consumption of butter increased during the same period by 18 per cent. If the figures could be brought down to the ten-year period previous to 1913, the increase would probably be larger.

The Export Trade.

The export record for 1913 presents no very notable feature except the further decline of nearly two hundred thousand boxes, or between eleven and twelve million pounds of cheese as compared with 1912. The removal of the United States duty on milk and cream, and the reduction of the duty on butter from 6 to 2½ cents per pound, and on cheese from 6 cents per pound to 20 per cent ad valorem, has not affected the shipments of dairy produce to the United States to any very great extent. After the new tariff came into effect on October 3, there was a considerable movement of milk and cream across the border for the first two or three months, but owing to the great slump in the United States dairy markets the shipments fell off very rapidly after the New Year, and at the present time there is very little export of either milk or cream to the United States except that which is covered by definite contracts.

The Importation of New Zealand Butter.

The total quantity of New Zealand and Australian (chiefly New Zealand) butter imported into Canada at the port of Vancouver during the year ended March 31, 1913, was 6,018,022 pounds. The shipments have increased slightly during the past year, but not to the extent that was expected. The development of this trade has attracted considerable attention and great expectations have been built upon it, both in Canada and in Australasia, but it seems probable that it has about reached its limit, and that the increased production in the prairie provinces will be sufficient before many years have passed to supply all western demands.

The Export of Green Cheese.

It cannot be repeated too often that the Canadian cheese trade has been and is still being seriously injured by the export of green immature cheese. There are very serious complaints on this score from dealers in the United Kingdom. It would be well for Canadians to bear in mind that they are now meeting their first serious competition in supplying the Old Country markets with cheese of the cheddar type. It has been a very popular fallacy that Canadian cheese drove United States cheese out of the market. The fact is that the United States dropped out of the export trade because they required their whole production for domestic consumption. New Zealand, however, is likely to have an increasing surplus for export, and Holland and Siberia are preparing to secure a share of the trade. Canadian cheesemakers will have no difficulty in maintaining their present lead if they are not handicapped too severely by what may be termed the business management of the factory, for it is generally admitted that the quality of Canadian cheese, if properly handled after it is made, will easily hold its own with the product of any other country.

The long period during which the Canadian cheese industry was comparatively free from competition, that is to say from the time of the decline in the United States exports until the New Zealand shipments became large enough to compel attention,

appears to have lulled those who are responsible for some things into a feeling of security—a very dangerous condition. It is time that there was an awakening of interest in matters which may affect the future of the trade.

FINCH AND BROME DAIRY STATIONS.

A statement of the business done at these stations will be found in appendix IV. The milk was received at both stations throughout the winter, and while the supply was rather small for two or three months, continuous operation seemed to be worth while for the purpose of encouraging the production of winter milk. The patrons at the Finch station are taking a great deal of interest in this matter and supplied nearly three times as much milk in the winter of 1913-14 as they did during the previous winter. The patrons of both stations appreciate very highly the clean, sweet, pasteurized skim-milk which is returned to them, and on that account the patrons at Finch prefer to have their milk manufactured into butter during the spring months in order to secure the skim-milk for stock raising purposes.

WINTER DAIRYING.

Winter dairying was first seriously advocated in Canada about twenty-four years ago and quite a large number of cheese factories were equipped at that time with facilities for making butter during the winter months. Unfortunately there followed a period of rather low prices for butter, which, together with the limited supply of milk, made the profitable operation of winter creameries a very difficult matter.

There were not many farmers at that time who were properly equipped for the profitable production of winter milk. During the intervening years stables have been improved, silos have been erected in large numbers and, with better feeding and care, milk can now be produced during the winter months in larger quantities and with more profit, especially as the winter prices for dairy products have materially and relatively increased. The demand for market milk and cream has enormously increased during the past ten years. Taking all these facts into consideration, the outlook for winter milk is exceedingly bright at present.

EXTENSION OF MARKETS.

The work carried on under this division was along the same lines as in previous years. Cargo inspection at ports in Great Britain and in Canada, inspection and general supervision of the subsidized refrigerator car services, the collection of statistics of prices for farm products, are the chief activities of the Extension of Markets Division.

With your authority, the chief of the division, Mr. W. W. Moore, visited the United Kingdom last autumn to get a closer view of the work being done by the cargo inspectors employed on that side of the Atlantic, and to carry out some reorganization of the service. Mr. Moore, being on the markets during the arrival of the heaviest of the Canadian apple shipments, was enabled to gather much useful

information respecting conditions which affect the sale of apples on the Old Country markets, particulars of which will be found in appendix II.

Mr. A. W. Grindley, chief cargo inspector at Liverpool, died on June 21, 1913. Mr. Grindley had filled this position very acceptably since 1901 and had succeeded in identifying himself closely with the Canadian produce trade in the United Kingdom. Owing to other changes in the service, I recommend that this office should not be refilled.

Mr. Wm. Carter, cargo inspector at Liverpool and Manchester, died on January 2, 1914. Mr. Carter has been employed about eight years, during which time he rendered excellent service. Mr. P. J. Gabler, of Liverpool, has been appointed as successor to Mr. Carter.

BROKEN CHEESE BOXES.

In my last report I referred to the large percentage of cheese which arrive in Montreal in broken boxes, and which eventually reach the United Kingdom in a very dilapidated and damaged condition. Many new boxes are placed on the cheese by Montreal exporters to replace those which are broken beyond repair, while others are tied up with cord to hold the broken parts together. By the time the shipments reach the Old Country still further damage is sustained and the general appearance is discreditable and prejudicial to the sale of the cheese.

A large expenditure is incurred by the exporter in the coopering and renewing of boxes, and this expense is, of course, included with other 'costs' of handling the cheese and it eventually comes out of the producer by reducing the price of cheese to that extent.

The breakage would be less if those who order the boxes were careful to see that they fitted the cheeses snugly, and much damage in transit would be avoided by more careful loading and stowing in the cars. The remedy seems to lie in the substitution of a stronger package for the flimsy box now in use. It is true that the boxes are not as strong now as they formerly were, but the increasing scarcity of suitable timber and consequent advance in price of box material stand in the way of much improvement in the box itself.

Some interest having been shown in the possibility of adopting the New Zealand cheese crate, which was illustrated in my last report, I arranged to have several sample crates sent out from London. These were shown at the various dairy conventions in Ontario and Quebec during the past winter. Some of the exporters have expressed themselves as being favourable to the New Zealand crate, while others are inclined to oppose any change in the style of the Canadian package. There has always been objection to innovations in the dairy trade. The square box for butter was very strenuously objected to when it was first introduced. The paraffining of cheese was condemned on all hands, and yet to-day there are very few cheeses which go into storage for any length of time that are not paraffined, and the square butter box is all but universally used. Importers in Great Britain, especially those in London, where the great bulk of the New Zealand cheese is handled, are generally quite favourable to

the use of the New Zealand crate for Canadian cheese. In Liverpool and other centres some of the merchants think that Canada would lose something by giving up the distinctive package. I am of the opinion that there would be very little permanent disadvantage to the industry by the adoption of any other suitable style of package. The character of the wood which would be used for Canadian crates would distinguish them from those made in New Zealand. I am not aware that Canadian cheese ever lost anything by being shipped to the United Kingdom in the same style of package as that which was used for United States cheese. As a matter of fact, the Canadian cheesemakers got the idea of the veneer cheese box from the United States. The New Zealand crate has the very decided advantage that it will carry the cheese without breaking and at present prices, the crate which holds two cheeses would cost just about the same as two boxes. If the price of boxes continues to advance as it has done for the last two or three years, the crate will soon be the cheaper package of the two. Manufacturers of cheese-box stock claim that in five or six years the supply of elm, which is the only timber suitable for veneer, will be practically exhausted.

The Fruit Division.

The reorganization of the fruit inspection service as carried out in 1912-13 has proved to be very satisfactory. The district inspectors have been given more authority, which makes it possible for them to deal more promptly with violations in their respective districts. Two additional sub-districts with inspectors over each were established in Nova Scotia during the year, one in Cape Breton and the other in the fruit-growing districts in Lunenburg county on the south shore. Otherwise the assignment of inspectors was similar to that reported last year.

THE MARKETING OF GREEN IMMATURE FRUIT.

Complaints are still very common as to the quantity of fruit of different kinds which is marketed in a green, immature condition. There is no doubt that this practice is detrimental to the best interests of the fruit trade and has a tendency to discourage the consumption of fruit in many quarters.

APPLE-PACKING DEMONSTRATIONS.

The demand for instruction in the packing of apples in boxes was greater than ever during the past year, and Mr. P. J. Carey, the expert employed to give instruction in fruit packing, was kept busy during the season in various localities of Eastern Canada

THE FRUIT CROP REPORT.

The Fruit Crop Report was published monthly from May to September as in former years.

BULLETIN NO. 34.

Although the publication of Bulletin No. 34, entitled "Modern Methods of Packing Apples and Pears" was started during the previous year it was not issued

until after the first of April. This was practically the last work done by the late Mr. McNeill before he was laid up by the illness which proved to be his last. There has been such an unusual demand for this bulletin that a second edition is now in the hands of the printer.

THE LATE ALEXANDER MCNEILL.

The branch lost, during the year, one of its most prominent and useful officers in the death of Mr. Alex. McNeill, chief of the Fruit Division since 1905. After a long and distressing illness Mr. McNeill died on December 14, 1913, much regretted by his fellow-workers and by a very large circle of friends. For years Mr. McNeill performed his duties regularly under physical disabilities that would have put most in bed. His cheerfulness and energy under the circumstances were remarkable. As chief of the Fruit Division, Mr. McNeill did much valuable work in the interest of fruit growing in this country. His service was of the unselfish kind which perpetuates itself.

SEPARATION OF THE FRUIT DIVISION.

I venture to express the hope that you will see your way clear, at an early date, to relieve me of the responsibility for the Fruit Division, in accordance with my formal request made in December last. The rapid extension of the activities of this branch during recent years would seem to justify a further division of work. There is plenty of scope in connection with Dairying, Extension of Markets and Cold Storage Divisions for one man's whole time and abilities, and I feel sure that a Fruit Branch under the direction of a capable man who would devote his whole time to it, would advance to increased usefulness.

STATISTICS OF FRUIT INSPECTION.

The details of inspections, prosecutions, convictions, &c., along with other matters of interest relating to the work of the Fruit Division will be found in appendix III. I am indebted to Mr. F. H. Grindley, technical assistant in the Fruit Division, for much of the work of preparing the report for the division.

COLD STORAGE.

COLD STORAGE SUBSIDIES.

The Cold Storage Act (1907) which provides for the payment of subsidies to public cold storage warehouses, under certain conditions, to the extent of 30 per cent of the cost, has encouraged the erection of small cold stores at country points. In this way, storage facilities are provided as near as possible to the point of production, and the goods are placed in cold storage with the least possible loss of time or chance for deterioration. These local warehouses tend to prevent the accumulation of large quantities of perishable produce in the main centres of distribution, and

the writer believes that there is no surer or more satisfactory way of providing against a manipulation of prices by an unfair use of the cold storage industry in holding perishable foods of seasonal production.

The main advantage, however, in having local cold storage warehouses at points of production is that such a plan enables the producer or dealer to place his perishable goods in safe keeping with the least possible delay. They can be transported to consuming centres at a more favourable season of the year, or in any case in large enough quantities to permit of carload shipments and the use of refrigerator cars. The movement of produce, from the producer of small lots to dealers or consumers at distant points, must be carried out in many cases in less-than-carload lots and, therefore, without the protection afforded by the iced car.

The prejudice which exists in some quarters against cold-stored foods has its root very largely in the fact that these foods are often out of condition before they reach the warehouse. The local cold storage helps to prevent such conditions from arising.

Since the passing of the Act in 1907, thirty public cold storage warehouses have been erected and received the subsidy, with a total refrigerated space of nearly 5,000,000 cubic feet, practically doubling the refrigerated space for public use which was then available.

Warehouses were completed and put into operation during the year at Port Hawkesbury, N.S., Penticton, B.C., Edmonton, Alta., and Vonda, Sask.

Further contracts have been entered into for the payment of subsidies on warehouses to be erected at Lethbridge, Alta., and Saskatoon, Sask.

For a complete list of all subsidized cold storage warehouses see Appendix VII.

Creamery Cold Storage Bonuses.

The bonus of $100 given to creameries to assist in the erection of suitable refrigerators was secured by 39 applicants out of a total of 110. Those who failed to receive the bonus had themselves to blame for not complying with the conditions.

Iced Car Service.

The iced car services for butter and cheese and for fruit intended for export in cold storage were continued by arrangement with the railways, as in former years.

The Third International Congress of Refrigeration.

I had the honour to be with the official delegate from Canada at this important gathering. The foreign delegates met in New York during the week beginning Monday, September 8. Preliminary meetings were held, and a number of the principal refrigerating installations were inspected. On September 14, the delegates left by special train for Washington, D.C. On Monday the 15th, the formal opening of the congress took place in the Auditorium of the National Museum, under

the presidency of Dr. Frank W. Gunsalus, director of the Armour Institute, Chicago. The delegates were welcomed on behalf of the United States Government, by the Hon. W. J. Bryan, and your representative was called upon to respond for Canada, as were also the other official delegates for their respective countries. In the evening an official reception was held in the beautiful Pan American Union building. This function was attended by a large number of ladies and gentlemen from diplomatic and official circles. On Tuesday morning the delegates were received by President Wilson at the White House, after which they proceeded to Chicago by two special trains. Arriving in Chicago the next morning the serious business of the congress was begun without delay.

The proceedings were conducted in six sections, at which over 200 papers were presented, dealing with the many different applications of refrigeration. The writer was elected one of the honourary presidents of the third section.

Over 800 delegates were registered, and the following countries were represented officially: Austria, Argentina, Australia, Belgium, Brazil, Canada, China, Chili, Denmark, France, Germany, Greece, Honduras, Holland, Italy, Japan, New Zealand, Norway, Paraguay, Russia and Sweden.

The American Association of Refrigeration had charge of all the details and arrangements for the congress. The officers deserve great credit for the admirable manner in which the business was managed.

STAFF IN 1913-14.

The total number of employees in this branch, in the outside and inside service, including temporary clerks and temporary fruit and cargo inspectors, was 157, an increase of 10 over the previous year. In the inside service there were 8 technical officers and 27 clerks and messengers.

The outside staff numbered 122 persons employed as follows:—

Employed by the year.

1 Assistant Dairy Commissioner, J. C. Chapais.
5 dairy experts.
4 inspectors of dairy products.
5 district fruit inspectors.
1 demonstrator in fruit packing
8 permanent fruit inspectors.
3 special fruit inspectors (Customs officers).
1 chief cargo inspector, Montreal.
1 cargo inspector (Montreal, and Portland, Me.)
1 chief cargo inspector in Great Britain.
4 cargo inspectors (at London, Bristol, Liverpool and Glasgow).
23 dairy recorders.
2 stenographers.—59.

Employed for different periods up to seven months.

35 temporary fruit inspectors.
10 helpers to fruit inspectors.
7 cargo inspectors.
4 iced car inspectors.
7 assistants at dairy stations.—63

GENERAL.

MEETINGS.

The usual number of meetings have been addressed by several members of the staff who are from time to time assigned to that duty.

PUBLICATIONS.

The following publications have been added to our list during the year:

Bulletins.

39. List of Cheese Factories, Creameries, Condensed Milk and City Plants, &c., in Canada. (Supersedes No. 31.)

40. The Inspection and Sale Act, Part IX. (The Fruit Marks Act as amended in 1907-08 and 1912-13), with Regulations.

41. Cheese Factory and Creamery Plans with Specifications.

Circulars.

8. Apple Dealers in Manitoba, Saskatchewan, Alberta and Northern Ontario.
9. Amendments to the Inspection and Sale Act Part IX in 1913.
10. Notes on Cow Testing.

Fruit Crop Reports.

A monthly Fruit Crop Report was issued from May to September (5 numbers).

CORRESPONDENCE.

There has been a very noticeable increase in the correspondence of the office during the past year. It covers rather a wide range of subjects, related to the dairying industry, the fruit trade and cold storage.

ACKNOWLEDGEMENTS.

I again have pleasure in testifying to the good work done by members of the staff. I wish particularly to acknowledge the valuable assistance rendered by Mr. F. H. Grindley and Miss K. B. Robinson, of the Fruit Division, during the illness of Mr. McNeill.

I have the honour to be, sir, your obedient servant,

J. A. RUDDICK,
Dairy and Cold Storage Commissioner.

APPENDIX I.

REPORT OF THE ASSISTANT DAIRY COMMISSIONER, MR. J. C. CHAPAIS.

SAINT-DENIS (EN BAS) COUNTY OF KAMOURASKA, QUE.

I beg leave to present my twenty-fourth report as Assistant Dairy Commissioner, which covers the period of twelve months between April 1, 1913, and March 31, 1914.

SUMMARY OF WORK.

In submitting a summary of my work during the year 1913-14, I will first draw your attention to the fact that to my duties as Assistant Dairy Commissioner have been added this year those of officer for carrying out the provisions of "The Agricultural Instruction Act" in so far as the same affect the province of Quebec. This will explain why I have had to devote a good deal of my time to the fulfilment of those new functions, this having consequently brought a diminution in my usual lecturing trips and my ordinary work concerning dairying.

In the provinces of Ontario and Quebec, I have, during the last twelve months made, in sixteen counties, thirty-nine visits in twenty-three localities. I have delivered forty-seven lectures before three thousand eight hundred and eighty-six persons, of whom one hundred and five were butter and cheesemakers. The average attendance at those lectures was eighty-two persons. Of the twenty-three localities visited, three of them were visited for the first time. I have travelled eight thousand and sixty-six miles to perform my work.

The following is a list of the counties and the localities visited and lectures delivered with reference letters indicating the purpose of the meetings thus attended.

TABLE OF VISITS AND LECTURES.

Counties.	Localities.	Visits.	Lectures.	Letters of Reference.
	Province of Ontario.			
Lincoln	Grimsby	1		a
Ottawa	Ottawa city	4	1	a
Toronto	Toronto city	1	2	a
Wellington, S. R.	Guelph	1	1	a
	Province of Quebec.			
Brome	Sutton	2	3	b, c, g
Compton	Cookshire	1	1	c
	Waterville	1	1	d, f
Jacques-Cartier	Macdonald College	1	2	a
	"	—	2	a, e
Kamouraska	Saint Denis	2	2	c
	Saint Pacôme	2	1	b
	Saint Paschal	1	3	a, g
	"	3	2	b
	Sainte Anne de la Pocatière	2	2	b, f
	" "	1	1	a
Lake St. John	Roberval	1	1	b
Montreal	Montreal city	1	1	a
Quebec	Quebec city	5	5	a
Richmond	Asbestos	1	1	c
	Danville	1	1	c
	"	–	1	c, e
	Windsor Mills	1	1	c
Rouville	Rougemont	1	1	a
	"	—	1	a, e
Stanstead	Magog	1	1	c
	Stanstead	1	2	b, g
Temiscouata	Rivière-du-Loup	1	1	a
Two Mountains	La Trappe, Oka	2	3	a, g
16	23	39	47	

Reference letters indicate:

(*a*) Federal and Provincial Meetings.
(*b*) County and District Meetings.
(*c*) Farmers' Club Meetings.
(*d*) Parish Meetings.
(*e*) English Lectures.
(*f*) Factory inspections.
(*g*) Visits in Colleges and Schools.

The above given table shows that I have attended twenty-one federal and provincial meetings, eleven county and district meetings, eight Farmers' Club meetings, one parish meeting, that I have delivered four lectures in English, that I have made two factory inspections and that I have delivered nine lectures in colleges and schools.

Federal and Provincial Meetings.

The first provincial meeting attended during the last twelve months was the annual convention of the Agricultural Missionaries of the Province of Quebec, held at Sainte Anne de la Pocatière, Kamouraska county, on July 15 and 16. I delivered before that convention a lecture entitled 'The Dying Land' (La terre qui meurt). The second one was a gathering of one hundred sisters from various convents congregated at the Normal Domestic Science School of Saint Paschal, Kamouraska county, in

August, taking a post graduate course, and before which I delivered three lectures on 'Weeds,' 'Noxious Insects' and 'Fruit Growing,' on August 14. The third one was the fiftieth annual meeting of the Ontario Entomological Society, held at Guelph and Grimsby, Ont. I was appointed a delegate to attend that convention by the Quebec Society for the Protection of Plants. It was held on August 27, 28, and 29. The fourth one was the summer convention of the Quebec Pomological Society held at Rougemont on September 8, and before which I delivered a lecture on 'A new Emulsion both Insecticide and Cryptogamic.' The fifth provincial meeting attended was held at Quebec, where I was invited by the Honourable Mr. Caron, Provincial Minister of Agriculture, on September 11, to discuss the best means of introducing agricultural science in the secondary schools of the province. The annual convention of the Quebec Dairymen's Association held at Rivière-du-Loup, Temiscouata county, on the 2nd and 3rd of December, was the next provincial meeting I attended. Before it I delivered a lecture on 'Bovine Tuberculosis.' On March 24 and 25 I attended a federal convention of all the provincial authorities of the Dominion who are interested in carrying out the dispositions of the 'Agricultural Instruction Act.' The eighth provincial convention attended was the annual convention of the Quebec Society for the Protection of Plants held at Macdonald College, Jacques Cartier county, on March 26, and before which I made a report of my trip as that society's delegate to the fiftieth convention of the Ontario Entomological Society, and I also delivered a lecture on 'The White Cystopus.'

Besides these eight conventions, I have had to make several trips to Ottawa, Quebec and Toronto to meet, on official business and interviews, the Honourable Federal Minister of Agriculture, the Federal Dairy and Cold Storage Commissioner, Mr. C. C. James, Federal Agricultural Commissioner, the Deputy Minister of Agriculture of Ontario, the Honourable the Minister and Deputy Minister of Agriculture of Quebec, to attend the Quebec and Toronto Exhibitions, to visit the Montreal Laval Veterinary School, the Oka Agricultural Institute, the Agricultural School at Sainte Anne de la Pocatière, etc.

COUNTY AND DISTRICT MEETINGS.

I also attended nine county and district meetings. Two of them were held at Sainte Anne de la Pocatière, Kamouraska county, one on the 15th of April, to complete the organization for the establishment of a demonstration orchard, and one on the 16th of January, being the annual meeting of the Kamouraska Agricultural Co-operative Society, before which I delivered a lecture on "A Progressive Horticultural Society," being the history of the Kamouraska County Horticultural Society. Two others were held at Saint Pacôme, Kamouraska county, being meetings of the board of directors of the Kamouraska Horticultural Society. On the 25th of September, I attended at Saint Paschal the exhibition of the Kamouraska County Horticultural Society, where before a meeting of over one thousand persons, I delivered a lecture on "The Importance of Horticulture and Fruit Growing." At the same place, I attended two other meetings, one of the board of directors of the Kamouraska Horticultural Society and the other the annual convention of the same society held on February 3, before which I delivered an address on the operations and progress of that society since its opening in 1908. On October 23 and 24, I attended at Roberval, Lake St. John county, the fiftieth anniversary of religious profession of Sister Saint Raphael, the founder of the first Domestic Science School of America, opened at Roberval in 1882. I prepared for that occasion an historical sketch of that institution. The two last district meetings attended during the year were those held at the Stanstead and Sutton Domestic Schools, respectively on February 11 and 13th. I delivered at each place two lectures, one on "What is the object of Domestic Science Schools," and one on "The Principles of Domestic Economy."

LECTURES BEFORE FARMERS' CLUBS.

As usual I delivered lectures before Farmers' Clubs in the province of Quebec, but much fewer than usual for the reasons mentioned at the beginning of this report. The ten lectures I delivered this year were given before the Farmers' Club of Sutton, Brome county; Cookshire and Waterville, Compton county; Saint Denis, Kamouraska county; Asbestos, Danville and Windsor Mills, Richmond county; and Magog, Stanstead county. The subjects of the lectures were: "Corn Culture," Fruit Growing," "Our Sins as Dairymen," "Principles of Rural Economy," "Dairy Husbandry."

FACTORY INSPECTIONS.

I have made only two factory inspections this year, one at the newly-built cheese and butter factory of the Agricultural School of Sainte Anne de la Pocatière, Kamouraska county, which is a fine substantial building equipped with first-class apparatus, and one at Waterville, Compton county, a butter factory running the whole year.

VISITS TO SCHOOLS AND COLLEGES.

While I was making my various lecturing trips and visits, during the last twelve months, I visited four agricultural colleges and schools, and four domestic science schools. The agricultural colleges and schools were those of Guelph, Ont., Oka, Macdonald, Sainte Anne de la Pocatière, and the domestic science schools were those of Roberval, Saint Paschal, Stanstead and Sutton. I delivered nine special lectures at these institutions.

OFFICE WORK.

On account of the new duties assigned to me in connection with the "Agricultural Instruction Act," I have had to perform more office work than usual. Besides that new work, I had to perform about the same amount of office work as Assistant Dairy Commissioner as formerly, to prepare my lectures for my own meetings, to write articles for the agricultural press, and to answer the inquiries of my correspondents.

I append here a list of the papers and lectures that I have written during the last twelve months, in French (F) and in English (E).

Notes on Dairying in New Zealand, F.
Preservation of Wood Lots on Farms, F.
Ground Phosphate as Fertilizer, F.
Death of Dr. Gustave de Laval, F.
Effective Cream Separation, F.
Fodders and Cattle, F.
Causes having an Influence on Butter Composition, F.
Complementary Fertilizers, F.
The Work of the Quebec Agricultural Missionaries, F.
Butter Mould, F.
Canadian Butter and the Hand Separator, F.
Wild Mustard. Sun Spurge, F.
Honey, Its Granulation, Its Analysis, F.
Summer Convention of the Quebec Pomological Society, F.
New Zealand Butter in Canada, F.

A New Emulsion both Insecticide and Anticryptogamic, F. and E.
Bovine Tuberculosis, F.
Notes on Blueberry Culture, F. and E.
Dairying in Canada, F.
Beef Cattle, Dairy Cattle, F.
New and Old Seeds, F.
A Progressive Horticultural Society, F.
Dairy Chronicle, F.
Historical Sketch of the Roberval School of Domestic Science, F.
A Talk on Chemical Manures, F.
New Discoveries Concerning Milk, F.
The White Cystopus, F. and E.
Report as Delegate to the 50th Convention of the Ontario Entomological Society, F. and E.

Closing Remarks.

In closing I have only one thing further to add. I have observed lately while making a lecturing tour in the Eastern Townships, that there is a strong tendency amongst many dairy patrons to yield to the temptation of selling milk and cream to Americans, as well as some of their dairy cattle on account of the recent change in the United States tariff. This has already caused the closing of a few factories and may injure the interests of some of the factory owners and butter and cheesemakers of the many localities in the vicinity of the boundary line in eastern Ontario and Quebec.

APPENDIX II.

REPORT OF W. W. MOORE, CHIEF, EXTENSION OF MARKETS DIVISION.

SIR,—I have the honour to present herewith the report of the Extension of Markets Division for the year ending March 31, 1914.

CHEESE TRANSPORTATION.

As a result of investigations made during the cheese-shipping season in 1912, it was found that the cause of the major portion of the breakage in boxes shipped from country points to Montreal was due to the fact that in loading the cheese in the cars sufficient care was not taken to stow the boxes closely so that they could not knock about in transit, or while the cars were being shunted.

Following up the letters sent from this office to individual shippers in 1912 and the circulars issued at our request by the railway companies to their agents instructing them to supervise the loading of cheese as far as they possibly could, the following letter was published in all the newspapers printed in the cheese-producing sections in eastern Ontario and Quebec and a copy was also mailed direct to each cheese factory in the above territory:—

DOMINION OF CANADA—DEPARTMENT OF AGRICULTURE.

DAIRY AND COLD STORAGE COMMISSIONER'S BRANCH.

OTTAWA, May 21. 1913.

An Open Letter to Patrons of Cheese Factories, Cheesemakers and Factory Owners.

In the early part of the summer of 1912, complaints were received by this Department from Montreal cheese merchants to the effect that the proportion of broken boxes among the consignments of cheese they were receiving by rail from points in Quebec and eastern Ontario was much greater than usual and an inspector was at once assigned to duty at the railway terminals in Montreal in order to check the condition of the boxes as they were delivered from the cars. A travelling inspector was also sent out to investigate the manner in which cheese were handled and loaded at country shipping points. All carload shipments are loaded by the men who draw the cheese from the factory. The inspectors found that the cause of probably 90 per cent of the breakage was due to the fact that, in loading the cheese, care was not taken to stow the boxes closely so that they could not knock about or fall down in transit and especially during shunting operations. The inspectors reported that it was a common practice to pile the cheese high in each end of the car with a vacant space across the centre into which the boxes pitched at the first heavy jolt the car received.

Wherever it was possible the inspectors reported the names and addresses of the shippers in whose lots considerable breakage was found, and letters were sent to them from this office urging more care in loading the cars. At our request both the Canadian Pacific and the Grand Trunk Railways issued

circulars to their agents instructing them, so far as their duties would permit, to supervise the loading of cheese. As a result, during the latter part of the season there was noticeable improvement in car stowage with a consequent reduction in the proportion of broken boxes, and this year we hope to see a much greater improvement.

As a rule the cheese are hauled to the railway stations and loaded in the cars by patrons of the factory; in other words by the men in whose interest it is that the cheese should reach the market in first-class condition. Now, if these men will not take the trouble to load their own cheese in the cars so that the boxes will remain intact and their contents uninjured, how can we expect anything better from railway and steamship employees?

Broken boxes result in damaged cheese, and damaged cheese means lower returns to patrons because, in the final analysis, all losses caused by poor condition or inferior quality are shouldered by those who produce the milk.

We therefore earnestly ask all patrons, factory owners and cheesemakers to pay close attention to the shipping of their cheese and especially to guard against loose, haphazard piling of boxes in the cars.

J. A. RUDDICK,
Commissioner.

W. W. MOORE,
Chief, Markets Division.

During the season of 1914 we hope to find considerable improvement in the condition of the boxes as they are unloaded from the cars at Montreal.

REFRIGERATOR CARS FOR CHEESE.

Under the usual arrangemeent with the railroad companies the department paid the cost of supplying two tons of ice to 1,145 refrigerator cars carrying cheese to Montreal and Quebec for export. The period covered was from June 16 to September 6, and the total payment amounted to $5,724.

REFRIGERATOR CARS FOR FRUIT.

An arrangement similar to that in effect for cheese was in force from the 1st of August to the 1st of October for shipments of early apples and tender fruits in carloads consigned to Montreal and Quebec for export in cold storage. Less than fifty cars were shipped, and the total disbursement by the department was $206.50.

BUTTER TRANSPORTATION.

From May 12 to October 11 special refrigerator cars were run weekly over the railroads in Ontario and Quebec for the carriage of butter at less than carload rates under a special guarantee of earnings from this department. These cars carried butter to London, Hamilton, Toronto, Ottawa, Montreal and Quebec. A car was also run weekly in Nova Scotia over the Dominion Atlantic railway from Yarmouth to Halifax. The total cost of this service to the department was $9,900.

INSPECTION OF BUTTER CARS.

Three refrigerator car inspectors were employed at Montreal and one at Toronto during the period in which the special butter cars were in operation. The total tonnage in the cars reported by the Montreal inspectors was approximately twenty-two and a half million pounds of butter and the average temperature of the butter as it was discharged from the cars was about 53 degrees. Over four million pounds of butter was carried in the cars reported by the Toronto inspector, while the average temperature of the butter was slightly under 56 degrees.

FARM PRICES.

Excepting the information furnished by each decennial census there are no statistics of the prices received by producers of farm products in Canada whereas in the United States for a number of years past, information of this character has been collected and published by the Federal Department of Agriculture. As this Branch has now a large number of dairy recorders stationed in various parts of eastern Canada, whose duties require them to visit the farmers in their districts regularly every month, it is obvious that a splendid opportunity here exists for a systematic collection of farm prices which should prove of considerable value. With this end in view schedules have been prepared and sent to each recorder to be returned the first of each month, showing prices received by the farmers for a certain list of products and a summary of these farm prices will appear in next year's report.

CARGO INSPECTION SERVICE.

During the past fiscal year the cargo inspection staff has consisted of six men at Montreal and one at Quebec for seven months, four men in Great Britain and one at Halifax the year round, and one at Portland, Maine, for five months. At the ports of St. John and Vancouver the fruit inspectors have acted as cargo inspectors as well.

THERMOGRAPH RECORDS.

In the past year, 560 records of temperature were obtained in steamers sailing from Montreal and Quebec, and 76 records in steamers sailing from Halifax. These records were obtained in cold storage chambers, cooled air compartments and in ordinary holds, and cover apples, pears, peaches, cheese, bacon, meats, etc. In some of the ships, carrying large perishable cargoes, as many as eight thermographs were placed. Over thirty-seven hundred copies of these records were made in this office.

Next season it is intended to increase the number of these instruments with fruit shipments out of the port of Halifax in order that more complete records may be obtained of the temperatures in the different holds of steamers carrying large cargoes of apples to British ports.

TRIP TO GREAT BRITAIN.

The month of November was spent by the chief of this division in Great Britain looking into the work of the cargo inspectors and getting first-hand information regarding the condition in which Canadian agricultural products were landed at the different ports, market requirements, etc. Special attention was paid to fruit shipments as apples were then arriving from Canada in large quantities. The storage accommodation on the docks and the facilities for discharging Canadian cheese and other perishable produce at the principal ports were examined and the cargo inspection service was reorganized to a certain extent so as to better cope with the existing conditions.

THE CANADIAN CHEESE TRADE.

In London and Bristol a good many complaints were made regarding short weight in shipments of Canadian cheese, and the custom of shipping 'green' or immature cheese was roundly condemned. In Glasgow the writer was informed that the cheese made in Prince Edward Island in 1913, which are largely shipped to the Glasgow market, were not up to the standard of former years in regard to quality. The leading importers in Glasgow spoke highly of Prince Edward Island cheese and claimed that it more closely resembled Scotch Cheddars than cheese made in any other part of Canada.

On the whole, Canadian cheese was well spoken of and most of the importers interviewed spoke in a tone of regret of the decreasing supply from Canada.

BROKEN BOXES.

In all the markets visited the fact that so large a proportion of the cheese boxes arrived in a badly broken condition was commented on, and it seemed to be the general opinion that the poor condition of the boxes on arrival in Great Britain means a depreciation of about one-quarter of a cent per pound on Canadian cheese, which is certainly a serious item. In London the majority of the import firms spoke highly of the crate holding two cheese such as is used by New Zealand and did not voice any particular objection to the use of a similar package for Canadian cheese. As London is the principal market for New Zealand cheese the porters in the warehouses there are accustomed to handling the crate, and they have become very expert in opening and closing these packages for weight testing purposes. In Liverpool, Bristol and Glasgow where New Zealand cheese are not so much in evidence a preference was usually expressed for the Canadian type of box. It was generally admitted, however, that so far as carriage is concerned the crate is the stronger and therefore the safer package.

DECREASING IMPORTANCE OF LIVERPOOL AS A CHEESE CENTRE.

A very noticeable tendency in the import cheese trade in England is the decreasing importance of Liverpool as a market for Canadian cheese. A few years ago Liverpool was considered to be the principal market for cheese made in this country but this pre-eminence has been gradually shifting to London which is now looked upon as headquarters for the whole import cheese trade.

LONDON THE WORLD'S MARKET.

It is generally recognized that London is the financial centre of the world, its premier port and greatest market. As a local market its food consumption is enormous, there being seven and a half million people (about the total population of Canada) within a radius of ten miles from the centre of the city. As a distributing point it is excellently served by nine trunk lines of railway, all with direct rail connection with the docks, and it has also regular steamship services to various Continental and British ports.

FRUIT SELLING SYSTEMS.

Within twelve months one million barrels of apples are received in London from overseas, besides large quantities of home-grown apples. The imported apples are sold by means of two systems, namely, by auction and by private sale (or "private treaty" as it is termed there). The auction sales are conducted at the Covent Garden market, Borough market and Spitalfields market. At Covent Garden the auctions are held on Mondays, Wednesdays and Fridays. The best day is Wednesday, as there are more out-of-town buyers present, while the poorest day is Friday. At the other two markets the sales are held on Tuesdays and Thursdays.

All imported apples are removed from the dock and stored in private warehouses, whereas in Liverpool only samples are taken from the dock and it is there that the buyer takes delivery.

One bad feature of the auction system, as conducted in the Floral Hall, Covent Garden, is the fact that a number of sales (three, four or five) may be going on at once, so that the buyers present are split up into groups and the number in attendance at one sale may not be sufficient to afford proper competition and the apples

may thus be sold below their value. An infinitely better plan is followed in Liverpool and Glasgow where the buyers are all assembled together and the brokers occupy the one rostrum in rotation, each being allotted so many minutes. Under present conditions some system of auction seems indispensable in the large centres in Great Britain, but so far as London is concerned there is certainly room for improvement in the manner in which the sales are carried on in the Floral Hall, Covent Garden.

Sale by private treaty is all right if all the money realized by the broker is returned to the shipper which, of course, is largely a question of the honesty and business integrity of the broker. For fruit of good quality and in good condition, private sale has certain advantages, but for out-of-condition stock which should be disposed of quickly, the auction method seems preferable.

It is well to have both systems in use as there is naturally strong competition between the auctioneers and the private salesmen, each trying to do as well as possible to avoid losing business to the other.

DOCK AND LANDING FACILITIES.

The Allan and Cunard-Thomson steamers from Montreal, and the Furness Line steamers from Halifax, land their apples at the Surrey Commercial dock, which is situated about 5½ miles from Convent Garden market, about 3½ miles from Spitalfields and about 3 miles from the Borough market. Cartage from the dock to these markets costs from 6 to 8 cents per barrel.

The apples are discharged from the steamers with reasonable care and are wheeled on trucks into the dock shed where they are sorted and piled to marks. From here the apples are taken to the various warehouses by horse teams and motor trucks, the former taking about 50 barrels and the latter about 60. One large firm, with its warehouse located on the river side, transfers its apples by barge.

CONDITION OF NOVA SCOTIAN APPLES THIS SEASON.

The condition of the Nova Scotian apples landed in London during the past autumn was distinctly bad, especially those ex steamers *Almeriana* which sailed October 10, and arrived the 22nd, *Shenandoah*, which sailed October 18 and arrived the 29th, and *Rappahannock*, which sailed October 30 and arrived November 13. The first-named steamer had about 17,000 barrels, the second about 29,000 and the third about 25,000, a grand total of 71,000 barrels.

It is difficult to estimate the total loss incurred on these three shipments, but it is probable that the amount involved would pay the interest for a number of years on a large sum of money invested in cold storage warehouses in the Annapolis valley. With the warm humid days and nights experienced last fall, conditions were very favourable for quick ripening and development of spot on the apples. It was found impossible to cool the warehouses, and the only thing to do was to rush the apples away to market as fast as possible. It is difficult to imagine, however, the heat that would be generated by the ripening processes of 20,000 barrels of apples, stowed together in a ship, that were loaded at a temperature of from 60 to 70 degrees. The ordinary ventilating fans would be powerless to lower the temperature of such a mass of fruit, packed in tightly-closed barrels, and after between two and three weeks of these conditions a grower wouldn't recognize his own apples if he saw them turned out of the barrels. Similar climatic conditions might not occur again for years, but a repetition one year in five would make preventive measures every year worth while. The remedy, it seems to me, is general cold storage facilities in the apple-growing section of Nova Scotia so that the apples can be stored at a controlled temperature soon after they are picked from the trees.

REPUTATION OF NOVA SCOTIAN APPLES IN GREAT BRITAIN.

In the past two seasons Nova Scotia has exported a large quantity of No. 3 grade apples, with this unfortunate but inevitable result that in the markets of Great Britain, Nova Scotian apples are looked upon as 'cheap' apples, and buyers expect to get them for less than they are willing to pay for apples from Ontario, Virginia, New York state, the western Pacific states or from British Columbia.

COMPETITION OF ENGLISH GROWN APPLES.

In the London market particularly, Nova Scotian apples are exposed to strong competition from English grown apples in the three months' period preceding Christmas. The latter are not graded or packed, but are simply poured into bushel baskets 'tree run' and marketed that way. On an average they sell for from 75 cents to 85 cents a bushel or about $2.65 per barrel. Some of the Kent growers are using the 40-lb. box and making a fair pack, but when the writer was there the market was flooded with the common stuff in baskets. Nova Scotian number threes are right up against these English apples, and it will be an exceptional season when it will pay to ship this grade to London. There is a future in the apple industry for districts that can grow high grade stuff at a reasonable cost, but none for sections producing a heavy proportion of the lower grades.

A GOOD SEASON FOR CANADAIAN PEARS.

A feature of the import fruit trade in Great Britain last season was the large supplies of Canadian pears, which as a rule realized good prices. The English and French crops were almost a total failure, and supplies from these sources were consequently very light. Unfortunately a considerable proportion of the Bartlett pears shipped from Canada were packed in barrels which is an entirely unsuitable package for this variety and should never be used for either the export or home trade. The Liverpool cargo inspector in his report, which will be found a few pages further on, refers to a loss occasioned by the shipment of Ontario Bartlett pears in barrels, which were condemned on arrival owing to their wretched condition. For the safe shipment of Bartlett pears to Great Britain the following three things are essential: half boxes, refrigerator cars and ocean cold storage. In addition, whenever possible, the pears should be pre-cooled before loading in the cars at the initial point of shipment.

The difference in condition on arrival in England between pears that had been pre-cooled and shipped in refrigerator cars and steamship cold storage and those lacking some or all of these advantages was clearly demonstrated in the case of shipments from the United States, as those shipped under the former conditions arrived in excellent shape, while many of the other consignments were landed in a wasty and damaged condition and were often a total loss.

SHED ACCOMMODATION FOR FRUIT INADEQUATE ON GLASGOW DOCKS.

Shortly after the return of the writer from Great Britain the following letter, which speaks for itself, was sent by the Dairy and Cold Storage Commissioner to the Donaldson and Allan Steamship lines in Glasgow:

OTTAWA, February 27, 1914.

The Donaldson Steamship Line,
58 Bothwell Street,
Glasgow, Scotland.

DEAR SIRS,—My assistant, Mr. W. W. Moore, spent some time in Glasgow last autumn looking into our cargo inspection service, the dock accommodation

and the facilities for discharging Canadian apples, cheese, etc., at your port. He also interviewed the principal fruit and produce importers and endeavoured to inform himself as thoroughly as possible on all matters connected with the import trade in Canadian farm and food products. As a result of his enquiries he became convinced that the provision of additional dock shed accommodation for the storage of Canadian apples would be a decided improvement. Under present conditions the apples landed from the steamers of the Donaldson and Allan lines have to be removed from the dock at once and carted to the warehouses of the various brokers, a distance of several miles. After the apples are sold they have to be again carted from the warehouse to the railway stations and docks for shipment to various points in Scotland and the north of England. If there was sufficient storage room on the dock, where your steamers berth, so that the apples could be sold ex quay, as in Liverpool, and only samples taken to the sales rooms, there would be less handling of the bulk which would be better for the apples and an advantage to everybody concerned. As you are aware, all the fruit landed in Glasgow by the steamers of the Anchor Line from New York is thus stored and sold. We believe that Messrs, Simons, Jacobs & Co., and other leading firms in the fruit trade, would strongly support the above suggestion and that they would be pleased to discuss the question with you. In the past your company has always shown a willingness to co-operate with this Department in any movement that would tend to protect and develop the export trade in Canadian farm products and I feel sure that you will give this matter your best consideration.

I am writing a similar letter to the Allan Line.

Yours very truly,

J. A. RUDDICK,
Commissioner.

REPLY.

GLASGOW, 13th March, 1914.

J. A. RUDDICK, Esq.,
Dairy and Cold Storage Commissioner,
Ottawa.

DEAR SIR,—We have to acknowledge your favour of the 27th ult., and all contents will have our careful attention.

Your suggestion is not a new one in the sense that we tried to put a similar arrangement in force a year or two ago, but owing to want of proper facilities being got from the Clyde Trustees, the scheme for selling ex quay fell through.

The writer will be from home for a few days, and on returning will take this matter up with the Allan Line and the Clyde Trust, and see if any further suggestions could be entertained.

You can rest assured we will do everything possible in the interests of the trade, and are,

Yours truly,

DONALDSON BROTHERS, LIMITED,
CHARLES DONALDSON,
Managing Director.

The Allan Line also acknowledged receipt of the Commissioner's letter on March 13, and stated that they would go into the matter carefully and write again later.

COMPARATIVE PRICES IN CANADIAN, UNITED STATES AND BRITISH MARKETS.

For several years past the annual reports of this division have included comparative wholesale quotations for various food products in the leading markets of Canada, the United States and Great Britain, and I present again this year similar statistics.

OBITUARY.

During the past year two vacancies occurred in our cargo inspection staff in Great Britain caused I regret to say by the death of Mr. A. W. Grindley, chief, cargo inspector for Great Britain, with headquarters at Liverpool, and of Mr. Wm. Carter, inspector for the ports of Liverpool and Manchester. Mr. Grindley died on June 21, 1913, and Mr. Carter on January 1, 1914. In both cases the end came suddenly. Both Mr. Grindley and Mr. Carter had been employed by this Department for many years and had rendered useful and conscientious service.

NEW APPOINTMENTS.

At Liverpool, Mr. P. J. Gabler was appointed to take the late Mr. Carter's place and the position of chief cargo inspector for Great Britain has been abolished. At Glasgow a change was made at the first of the year by the transference of Cargo Inspector Thomas E. Davis to Canada and the appointment of Mr. J. M. Manson in his place.

Reports of Cargo Inspectors in Great Britain.

Following are the annual reports of the cargo inspectors employed under the direction of this branch at Liverpool, London, Bristol and Glasgow:—

REPORT OF THE LIVERPOOL CARGO INSPECTOR.

Liverpool, March 31, 1914.

I beg to submit the following report covering the ports of Liverpool and Manchester.

Owing to the unfortunate deaths of the late chief cargo inspector Mr. A. W. Grindley, and my predecessor, Mr. W. Carter, during the past year, accurate totals of imports of bacon, cheese, eggs and frozen meat, for the purpose of comparison with last year's totals, are not available, but I have been able to get fairly accurate figures for apples and pears.

Receipts of Apples, Liverpool and Manchester.—There have been landed in Liverpool, 232,049 barrels and half-barrels, and 18,344 boxes of apples from Canada, out of a total of 557,048 barrels and half-barrels, and 217,918 boxes, from the United States and Canada combined. Last year the totals were 360,734 barrels and half-barrels and 7,843 boxes from Canada, out of a total of 917,800 barrels and half-barrels and 344,097 boxes from the United States and Canada.

There have also been landed in Manchester, during this season, 33,760 barrels and half-barrels and 520 boxes of Canadian apples.

Receipts of Pears.—Of pears, Liverpool received from Canada 2,291 barrels and 1,395 boxes and half boxes.

Peaches.—I know of one consignment of 865 trays of Ontario peaches, which was landed here, the quality and packing of which was good, but showing a slight waste. Plums and peaches which have been, and are at present, arriving from Cape Colony, South Africa, are of very fine quality, and in excellent condition, and have brought very good prices. It should be possible to get them here in a similar condition from Canada, with similar results.

The Apple Trade.—As I have only been engaged in cargo inspection work for the past two months, it follows that I cannot give an account for the whole year, more especially as the busiest part of the fruit season was over before I commenced, but, as I have been handling Canadian and other apples here for over twenty years, I may be permitted to offer some remarks, and perhaps some advice, based on my experience during that period.

It will be generally admitted that in these days of keen competition, continued improvement is necessary if we are to hold our own or keep ahead, and I would like to call the attention of Canadian packers to the fact that the western New York state people are making a big effort to capture the best of this market. Their fruit is very good quality generally, and very well graded, and they go sometimes to the extent of what may be termed fancy packing in barrels (i.e. fancy paper lace for the face of the barrel, and a pad at top and bottom). These apples easily command top prices.

Some of the best Canadian packers have recently resorted to mixing No. 1 and No. 2 grade apples in the same barrel, presumably with the object of making up lines of No. 1 at the remunerative prices which have for sometime past been obtained. Owing to the good demand, these have passed, but with much comment, and in a full season would have to be sold as 'mixed.'

Careless or Dishonest Packing and its Consequences.—It is to the careless packer, however, that I would call more serious attention, and it would be a good thing if the regulations with regard to these people were more stringent. They seem to lay themselves out to escape the inspector, and they spoil the good work done by the honest packer by getting a bad reputation for the Canadian trade. Many importers and buyers here and in Manchester, having been bitten, are very much against having anything to do with Canadians at all in consequence.

There are some brands which they will not even trouble to open for examination when inspecting others on the quay. I will give you one case out of several which came under my notice during the past season. A parcel of 177 barrels from one packer arrived by the Canadian Pacific Railway Company's steamer, about 40 per cent of which were wrongly marked. They were stencilled 'No. 1' but were also marked in pencil, in amongst the stencilling, as 'No. 2' or 'No. 2 mixed' and in some cases a different variety; some of the No. 2's were also wrongly marked in this way, the variety and grade in pencil invariably being correct, The apples were also of very poor quality, badly mixed below, and landed almost all slack. If these had been handled at night by gaslight, it would have been very difficult to discover these pencil marks, and they would have been sold according to stencil with the subsequent grumbling and claims of the buyers, and also creating a bad impression of Canadian packing generally.

New Port Regulations.—The Liverpool Port Sanitary Authority Inspectors have recently been collecting specimens of apples containing any spots or scale, which are being imported here, with the object of subjecting them to microscopical examination. The specimens particularly wanted are those containing what is variously called, "San José Scab," "San José Scale" or "San José Louse." Up to the present no specimens have been found in Ontario or Nova Scotian varieties, but they have been found in western New York state, Californian and Virginian.

Germany rejects any parcel imported which is found to contain this pest, and returns them again to the senders, and it is with the idea of doing something similar here, that these investigations are taking place.

As specimens have been found in the western New York State apples, it may handicap, in the near future, one of our greatest competitors.

Good demand for Boxed Apples, Properly Packed.—In my opinion sufficient attention is not given in Canada to the packing of apples in boxes. That there is a good market here for them, when properly packed and papered similar to those from Oregon, is proved by the quantity (given at the beginning of this report) of boxes handled here. If they are properly graded and the size in each box kept uniform (not mixed) and each apple wrapped, preferably in stamped papers, there is no reason why Canada should not participate in this trade with remunerative results.

The numbers most in demand during the greater part of the season are 140's to 200's, but in the beginning of the season any number will do, more especially if they are coloured apples. It has always struck me as strange that soft apples, such as Wolf River, St. Lawrence, Alexander, &c., are not packed in boxes in preference to barrels. The weight of the upper layers leads to the bruising of apples below and the consequent running of juice, making 'wet' and 'slack and wet' selections, and reduced saleable value. These coloured soft apples, arriving as they do in the early part of the season, when coloured apples are wanted, would, I am sure, amply repay any extra care in packing in boxes. The better they are put up, the better will be the result.

In shipping apples for Buenos Ayres, or any other distant place, where more than one handling is necessary, it would be a distinct advantage to have a cord tied around the centre of the box, to insure safe handling and minimize breakage. This is done with any lot bought here for shipment abroad.

Nova Scotian Apples.—This has been a remarkable season for Nova Scotian apples. The third cargo to arrive was a very poor one. I know several people who, having bought some of this cargo, had difficulty in disposing of them at less than half cost, owing to the badly spotted condition of the fruit, and I saw some which were also musty in the middle of the barrel, and simply rubbish. It was unfortunate that they were shipped here at all, as it made the buyers and their receivers very dubious for the rest of the season, regarding Nova Scotians, and they will undoubtedly be very careful with the early shipments in the next season. A new feature has been the introduction, on barrels stencilled No. 3, of a paper label containing the notification that the barrel contains No. 1 fruit in size, but with the defect of being spotted, short of colour, or otherwise defective. They have in most cases brought very good prices, but they did not in all cases merit the distinction of the label. As to the merits or demerits of the practice, it would not be easy to say in a season such as this, when, what in other seasons we would call rubbish, or pig food, has recently brought 12 shillings to 16 shillings per barrel. I am inclined to think, however, that in a full season buyers will not look with any favour on them. The extraordinary prices that have for some time been obtained are the most satisfactory part of an otherwise very moderate season.

A good season for Pears.—The past season has been a very favourable one for pears, owing in great measure to the shortage over here. The quality generally was good, and for anything arriving in satisfactory condition very good prices were obtained. The condition of some of the parcels, however, was very unsatisfactory. To be of any service here, they should arrive in as green a condition as possible, and to risk ordinary storage either at home or in any part of the transit, is not to be thought of. Ordinary stowage on part of the journey is the cause attributed to the faulty condition on

arrival of some shipments this season, but I have not the slightest hesitation in saying that the greater cause was that they were packed in barrels. The greater weight in a barrel of pears as compared with apples, leads to the less careful handling of pears in transit, and the consequent dropping of the barrels on their sides, causing bruising of the fruit. The more frequent cause of bruising, however, and the cause which most decreases the value is the heavy weight of the upper layers on the bottom ones, which flattens the pears at the bottom of the barrel and they, becoming wasty, leave room for the rest of the fruit to bump about in the barrel at each handling, and in turn become also bad. Prior to my engagement with the department this season I handled several consignments of 'Bartlett' pears packed for a well-known Ontario apple shipper, some 500 barrels of which were condemned and destroyed. The pears were of good quality and grading, and I attribute the loss mainly to the weight of the pears being packed in barrels. If these had been papered and packed in boxes, they would have brought a correspondingly high price to those which arrived in good condition packed in barrels, with the advantage that all would have arrived in good condition. I would consider it always the best policy to pack pears of any variety in boxes or half-boxes.

There has been a patent box for pears sent to London this season, which I believe has met with great success. I hope we will receive some in Liverpool and Manchester this next season as a test against packing in barrels.

Cheese.—With reference to cheese, many cargoes appear after being landed, to have been roughly handled, whereas the cause is attributable to the package itself, being in many cases too big for the cheese, and in the case of 'twin cheese' (i.e., two small cheese in an ordinary box) there is no support inside the box to prevent the box from breaking, owing to the bumping of the two loose cheese against the side of the box during handling. After conversations on the subject with some of the leading people here, I find that they are greatly in favour of the New Zealand style crate, both for appearance and suitability. I have seen several consignments of New Zealand cheese in crates, which have been landed in London, and handled several times since, without finding one broken or repaired package. If strips of tough wood, essentially without knots in them, are used, I see no better method than this crate to give satisfaction to all concerned.

Bacon.—Bacon is generally landed in good condition, but it certainly would be an improvement if the Canadian cases could be made to fit the contents a little more closely. In many cases there are from six to nine inches vacant space at either end and sides, which allow the contents to bump about during handling, causing the side of the box to bulge out and to eventually break.

No Eggs or Butter from Canada.—As far as I am aware no Canadian eggs or butter landed here this season.

Canned Apples.—For canned apples I have not the total quantity, but the three or four shipments I have seen have been landed in good condition, though in some cases the packages were very frail to stand the weight.

There have also been shipments of frozen poultry, boxes of offal, and tripe in bags which appear to have found a ready market.

Dock facilities.—In the matter of facilities here, there has been considerable improvement during the year, and the subject is at present engaging the attention of a special committee appointed for the purpose, as also for the means of transport from the docks.

Railway trucks now run inside or alongside all the sheds and some cargoes are transferred direct from the ship to them. Motor transport for quick despatch is greatly on the increase, including insulated vans on motor vehicles for refrigerator cargoes.

The dry-wet branch of the new Gladstone dock has been in use since January 1 this year, thus adding considerably to the available dock space.

There are also three or four more cold storages opened or in the course of erection.

Acknowledgements.—I wish here to thank the officials of the various shipping companies for the courtesy with which they have received me, on taking over this position, and for the assistance they have been willing to afford me. I beg to thank especially the secretary of the Manchester Fruit Brokers, Ltd., who at considerable trouble supplied me with the details of imports of apples for Manchester.

PHILIP J. GABLER.

REPORT OF THE LONDON CARGO INSPECTOR.

LONDON, March 31, 1914

Cheese.—During the year there were 758,805 boxes of cheese received here from Canada, and reports from the larger factors and firms handling this produce, generally speak well as to the quality of the season's make. There have been, of course, occasional complaints, particularly with regard to the immaturity of the cheese from the Quebec districts; also brokers complain of the difficulty of getting coloured cheese of a deep enough colour, despite repeated applications, but in the main the trade regards the quality as having been good, and an improvement upon the previous year.

Boxes.—The number of broken boxes has again been very heavy and there has been no improvement in this respect. As regards the handling here, the quantities discharged at a time from one hold have not been sufficiently large to warrant the working of an elevator-conveyor, and this machine has not been used during the past year; there is no doubt that this mechanical handling greatly reduces the number of boxes broken, in addition to expediting the discharge of cargoes. The boxes from the Listowel and Ingersoll districts have again come to hand in good shape and the cheese has been well boxed, with a minimum of breakage. The stowage in the ships' holds during the season has been generally good and in the absence of labour trouble at the docks the discharging of cargoes has been well carried out.

Smaller Imports from Canada Anticipated.—Many importers here are looking for a reduction in the export of cheese from Canada during the next few seasons, and I understand that some of the larger factories in Holland are commencing to make cheese approximating in size and shape to Canadians instead of the usual form of Dutch cheese, which is globular in shape, with a diameter of about eight inches.

Bacon.—Bacon has come to hand in reduced quantities which have been quickly cleared; the cases have stood the journey well considering the weights they contain and any damages have been made good on the quay-side as soon as landed. An extra band around the middle of cases would help to reduce the number of broken packages.

Apples.—With regard to apples, the season has been an exceptional one in many respects. The fall shipments from Nova Scotia were disappointing, probably owing to the very warm weather experienced in Canada, and the fact that the first arrivals made good prices caused large quantities of English apples to be rushed on the market, and a decided glut resulted.

The English crop held out much longer than was expected, but after the turn of the year prices hardened perceptably, and it is many years since such good results have been obtained.

Generally speaking the packing has been an improvement upon the previous year and complaints as to slack packing have been few; the sending from Nova Scotia of 'Labelled No. 3,' i.e. No. 1 in size, but not in quality, was attended with good returns, an average of 2 shillings to 3 shillings extra being made per barrel by these, over the ordinary No. 3's.

It should be noted that English growers are now producing increased quantities annually of good cooking apples, and as the area under these varieties is extending the outlook for green imported apples here is not good.

Pears.—The crop of English and French pears was very light indeed, and Canadian and American pears were sent from London to France; as a result in many cases record prices were made here, Bartletts making up to 50 shillings per barrel and to 5s. 6d. per half box.

Brokers emphasize the necessity of pears landing here in hard, green condition, and of their being sent at all times in cold storage. It is to be regretted that during the past season when prices were so good, several parcels of pears were received in an over-ripe condition.

Peaches.—The quantity of peaches received was not large and although a few half-boxes of 36 to 48 fruits made 9 shillings to 11 shillings per package, the general opinion of the trade was not favourable either as to the varieties sent or to the condition on arrival.

The stowage of fruit and barrelled apples and pears has been well done, but constant supervision is necessary to ensure the careful handling of these commodities.

I have to acknowledge the assistance and consideration at all times, of the various officials of the shipping companies both at docks and offices; also of the help given me by the Port of London Authority on many occasions.

A. E. GRIFFITH.

REPORT OF THE BRISTOL CARGO INSPECTOR.

BRISTOL, March 31, 1914.

Cheese.—From the 1st April, 1913, our total imports have been about 313,000 boxes, showing a falling off of about 73,000 boxes. Contrary to expectations, the extreme high prices experienced in the drought year of 1911 have been almost fully maintained on the average since, the only exception being the early part of last year. New Zealand cheese, deliverable from January to July, was contracted for very extensively by the retailers for deliveries for the whole of the period at very high prices, but after the contracts were made the market broke and prices dropped from 69 shillings and 70 shillings for first grade goods to 58 shillings and 60 shillings, and there was every prospect of lower rates ruling all round. One of the large multiple shops, however, within a few days contracted for about 75,000 boxes of cheese at the low prices then ruling, thus practically clearing the markets of available surplus stocks, and within a fortnight prices rose £9 a ton, purely in consequence of this operation, from which point they subsequently receded for a short time by 2 or 3 shillings, afterwards rising again until at present, prices are practically as high as in previous years.

The cheese during the year has been coming along in very good shape and, except for a few instances here and there, free from heat. With regard to the boxes, no improvement can be said to have taken place, but the suggestion of adopting a similar type of package to the New Zealand does not find favour with Bristol merchants. It may be all that could be wished for as a strong package and good for stowage on the voyage, but because of the time lost in opening in order to get the

cheese out for weighing and because it is a lumbersome package to handle, it does not appeal to the merchant. The Canadian style of box cannot be improved on; what is wanted is something stronger and better able to stand the frequent handling from factory to final destination.

Butter.—A small consignment of 1,728 boxes in two shipments came to hand during the months of August and September, the same arriving in very good condition. Comparatively high prices have ruled throughout the year and at no time has any noticeable accumulation of stocks been observed. The chief sources of supply have been New Zealand and the Continent.

Meats.—Our imports of Canadian meats have shown a big reduction this past year, our totals amounting to only about 800 cases. The most noticeable feature of the bacon market has been the great shortage in supplies of English cured, American and Canadian produce, and the enormous increase in the supplies of Irish, Danish, Dutch and Russian. In England a large number of pigs have been slaughtered because of the swine fever scare. Recently a society has been formed to encourage the breeding of pigs, but it is doubtful if this industry will ever be in the flourishing condition it was prior to the increased importation of colonial butter and cheese, as the farmers in ever-increasing numbers are selling their milk, instead of making these products, consequently there is no skimmed milk for pig feeding. The condition of the Canadian meat on arrival was excellent, health and food inspectors speaking highly of it. The most of our shipments were sent forward to London, though a quantity was retained here for Bristol merchants.

Apples.—A shortage of supply has also occurred in this article, one reason being the same as has affected all ports, viz., the shortness of yield in Ontario and Nova Scotia, and also because of the Royal Line steamers having taken up St. John, N.B., as their winter port, instead of Halifax, N.S., from which port in other years we received a good supply. This year the Nova Scotian apples have gone to other ports for distribution to South Wales, and the Bristol merchants still seem to favour getting their own requirements through London. Our totals for the past year amounted to about 21,000 barrels, and taken all through they have arrived in very good condition and well packed. High prices have ruled, so that importers have had nothing to complain of in this respect, Baldwins fetching up to 28 shillings and 29 shillings, G. Russet 32s. to 33s. 6d., other varieties accordingly. In the apple trade Cardiff is now taking a good position as a distributing centre, as within a small radius of this port there are large mining districts with a big population, and the working class there are taking more and more fruit than they did only a few years back, consequently Cardiff which only about ten years ago took no supplies of apples, now bids to become a large distributing centre, increasing yearly. The miners favour well-coloured apples, but there is a demand for No. 2's and 3's.

We also received 1,250 boxes of apples which arrived in excellent condition, well and carefully packed. I am of opinion that with No. 1 grades this mode of packing should be more adopted; it is preferable to the barrels for it is very rare to come across any fruit bruised or injured through tight packing.

Pears.—A small quantity of pears also came to hand (400 barrels of Duchess and Keiffer) and were sent through to Cardiff in good condition, where they made favourable prices.

Peaches.—No direct shipments of peaches have come to Bristol this year, what have been on sale here having come through from London. The fruit was in excellent condition and fetched good prices, retailing at 6 pence each. The past two months South African fruit has been coming along in good quantities, grapes, pears, plums,

peaches and nectarines, all arriving on this market in good shape. This trade is increasing.

Thermographs and Cold Storage.—Again this past year there has been no call for low temperatures in the steamers, their chambers being chiefly stowed with cheese, lard, and meats, and kept at cool air temperatures of from 40 to 50 degrees. The thermographs placed on board the different steamers have worked well and shown good results.

During the past year further extensions have been made to the cold storages at Avonmouth, chiefly because of the increasing large imports of frozen meats from Australia and New Zealand, and when completed the accommodation for meats, fruit and dairy produce will be up-to-date.

One of the chief features of the year has been the enormous quantity of grain that has come to hand from Canada which for a time taxed to the utmost the resources of the docks at Bristol, Avonmouth and at Portishead on the opposite side of the river. To meet the increasing trade, improvements and alterations are to be made in the old dock at Avonmouth, and two large grain storage warehouses are to be erected in the new dock all with up-to-date equipment for quick handling and delivery. The lack of accommodation for grain has been a complaint of long standing and the use of the transit sheds for grain storage has been a great detriment to general produce arriving from Canadian ports, which upon being landed had to be stacked in any possible space or corner that was available. The big rush of grain this past year did not improve matters, and serious representations were made to the head authorities. As a result, considerable improvement was brought about, and the sheds where the Canadian ships discharge are now kept free of grain to the betterment of the handling of general produce. In making representations regarding these matters from time to time I have always been met in the most courteous manner, with a willingness on the part of the officials to assist in any improvement for the benefit of the trade in general, and with expressions of appreciation of the work the department at Ottawa is carrying on in the interests of Canadian trade.

I again thank merchants and officials generally for courtesies at all times extended.

HORACE E. SHALLIS.

REPORT OF THE GLASGOW CARGO INSPECTOR.

GLASGOW, December 31, 1913.

I beg to submit a report of my work as cargo inspector for the nine* months ending December 31, 1913.

The work of inspection was carried out this season on the same lines as in former years, which, besides watching the discharge of cargoes, has involved the following up of goods—chiefly fruit—attending sales, and submitting with the regular shipping report, the price-marked catalogues of sales.

Apples.—The trade in Ontario apples this season holds a record for high prices, which have been upheld throughout. Kings, Wealthys, Greenings, Baldwins and Spys are varieties exceptionally well received here, and growers should make them a special line for this market. It is generally agreed that too many varieties have a tendency to keep the average market values down, especially in cases where lots are unknown locally. Buyers are not keen on unpopular sorts, and go to sales purposely to bid for stock familiar to their customers.

* At the end of the year Mr. Davis was transferred to Canada and Mr. John M. Manson was appointed to succeed him as cargo inspector at Glasgow, his appointment dating from January 1, 1914.

It would be an advantage if Ontario packers would protect both ends of the barrel with pulp heads, as frequently in the endeavour to guard against slacks, packages are over pressed and the fruit is bruised, the original object being thus frustrated.

Boxed apples.—Considerable quantities of boxed apples were landed during the season, and there appears to be a steady growth in the demand for the boxed package, especially with merchants who sell by private treaty. Good reports are to hand on the subject of pack and condition of consignments, and I need not emphasize the fact that to maintain the good reputation held here for this class of trade, only selected and clean varieties should be put up in boxes.

Marking of boxes.—Want of thought appears to be responsible for the unsatisfactory method adopted by some senders in marking the varieties and grades on the lid or side of the box, instead of the end where the name and brand is shown. When marked as above, and piled in warehouses, unnecessary and extra handling is involved before the merchant can determine the contents of package. This irritating practice can easily be remedied by placing full particulars on the end of the package.

Pears.—There have been considerable shipments of Duchess, Anjou, Clairgeau and Keiffers. They were packed chiefly in half-boxes and for the most part quickly cleared. Keiffers towards the finish showed signs of over-ripeness, but the cold storage facilities on steamers ensured the selling condition, without which this variety would certainly have arrived at a disadvantage. As an illustration of the merits of cold storage transit, one consignment of 740 boxes Keiffer pears was sent in ordinary stowage on steamer, and although shipped late in November, were landed in such a wasty and worthless condition that the sanitary authorities intervened.

Peaches.—Two small consignments of Elbertas were placed with merchants in excellent condition, but presumably through lack of appreciation, or possibly a preference for pears, they met with but little attention.

Thermographs.—Thermographs were placed with all consignments on steamers the record of which showed satisfactory temperatures throughout the season.

THOMAS E. DAVIS.

SUPPLEMENTARY REPORT.

GLASGOW, March 31, 1914.

I beg to submit my report for the three months ending 31st March, 1914.

Since my appointment on January 1 last the work of cargo inspection has been carried on much the same as formerly, including the attending of the arrival of steamers, watching the discharging of cargoes, examining same on dock and at stores, attending sales and sending priced catalogues along with regular shipping report.

Cheese.—At the opening of the season stocks of Canadian cheese were entirely depleted, but a big carry-forward of New Zealand cheese, together with prolonged imports of the same right up to the end of July reduced the demand for Canadian cheese, New Zealand cheese together with the home production of Scotch cheese being ample for trade requiremnts. From July to December shipments were in more normal proportions, and but for high cost in Canada probably much heavier quantities would have been required here. Relative to home cheese and other competing imports, Canadian cheese held its place fairly well. Quality was if anything

more satisfactory than the previous year, but importers continue to complain of losses from short weights. Undoubtedly the poor quality of timber now used in cheese boxes detracts from their appearance, and it would be well if factorymen would spend a little more to secure a more satisfactory box, and one that would not only be an improvement in appearance, but less liable to breakage. It has been remarked to me by one consignee that the boxes coming from the western districts of Ontario were usually in sounder condition than those shipped from Montreal. In some of the late-made shipments complaint was made of poor quality, due to want of curing. A number of shipments showed too much acidity and these cheese do a great deal of harm to the reputation and popularity of Canadian cheese as a whole.

Butter.—No shipments of Canadian butter were received during the season at this port.

Bacon.—Arrivals during the year show a considerable shrinkage in the total quantities, but the quality and condition have been uniformly good and no complaints have been made.

Apples.—Ontarian.—The season just finishing has been remarkable for high prices caused by shortage in arrivals. Towards the close of the season a large number of shipments were affected by frost, but even this did not prevent them from realising very high prices.

Boxed apples.—The prevailing opinion is that in the matter of packing the trend is towards improvement and, as boxes are in good demand for a high-class family trade, if still more care was exercised in the grading of apples in boxes for this market, better results would obtain.

Apples.—Nova Scotian.—Quality taken all through has been very good, but grading leaves something to be desired. A complaint here is the large percentage of No. 3 grade apples arriving from Nova Scotia but branded as No. 2. Another complaint is the want of steamer facilities from Halifax towards the end of the season, and one merchant here reports the loss of a large consignment owing to the steamer by which they were to leave being loaded in full at Boston and leaving out Halifax altogether, with the result that this consignment was distributed over other districts.

I would like to take this opportunity of expressing my indebtedness to the officials of the various lines of steamers, and also to the importers and merchants here for their courtesy on every occasion and their willingness to assist me in every way with my work.

JOHN M. MANSON.

WHOLESALE QUOTATIONS FOR BUTTER each week from April 2, 1913, to March 25, 1914.

(From "Boston Chamber of Commerce", "Producers' Price Current", "Daily Trade Bulletin", "Maritime Merchant", "Journal of Commerce", "Farm and Dairy" and "Winnipeg Free Press".)

Week.	Boston.	New York.	Chicago.	Halifax.	Montreal.	Toronto.	Winnipeg.
	"Extras."	"Extras."	"Extras."	"Creamery Solids."	"Creamery Solids."	"Creamery Solids."	"Creamery Solids."
1913.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.
April 2	.. - 36	34¾ - 35	34½ - 35	.....	29½ - 30	30 - 31	.....
" 9	.. - 36	35½ - ..	34 - ..	31 - 32	32½ - ..	30 - 31	31½ - ..
" 16	.. - 36	35½ - .	34 - ..	.....	33 - ..	30 - 31	.....
" 23	.. - 33½	33 - 33½	33 - ..	27 - 28	32 - ..	30 - 31	31½ - ..
" 30	.. - 29	30¾ - 31	29½ - 30	.....	27 - ..	30 - 31	31½ - ..
May 7	.. - 29	28½ - 29	27½ - ..	.. - 30	26 - 26½	27 - 28	31½ - ..
" 14	.. - 29	28½ - 29	27⅝ - ..	.....	26 - 26½	27 - 28	30½ - ..
" 21	.. - 29	28¾ - 29	27½ - 28	27 - .	26½ - 26⅝	27 - 28	28½ - ..
" 28	28 - ..	27½ - 27¾	27 - 27½	.....	26¼ - 26½	25 - 27	28½ - ..
June 4	28 - ..	27¾ - 28	27½ - ..	28 - 29	26 - ..	25 - 27	27½ - ..
" 11	28½ - ..	28 - 28¼	27½ - ..	.....	25½ - 25¾	25 - 27	26½ - ..
" 18	28½ - ..	28 - 28¼	27½ - 27¾	28 ..	25½ - 25⅞	25 - 27	26½ - ..
" 25	28 - ..	27¼ - 27½	27 - ..	.....	25½ - 25¾	25 - 27	26½ - ..
July 2	27½ - ..	27½ 27¾	26 - 26½	28 - ..	26 - 26¼	25 - 27	27 - ..
" 9	28 - ..	28¼ - 28½	26½ - 26¾	.....	25½ - 25¾	25 - 27	27 - ..
" 16	27½ - ..	26¾ - 27	26 - ..	28 - ..	25 - 25⅛	24 - 25½	26½ - 27
" 23	27½ - ..	26¾ - 27¼	26¼ - ..	.....	24¼ - 24½	24 - 25⅝	25 - 26
" 30	27 - ..	26½ 26¾	26 - ..	27 - ..	23¾ - 24	24 - 25½	24 - ..
Aug. 6	27½ - ..	26¾ - 27¼	26½ - ..	.....	24 - 24¼	24 - 25½	.....
" 13	27½ - ..	27¼ - 27¾	26¾ - 27	27 - ..	24¼ - 24½	24 - 25½	24 - ..
" 20	28½ - ..	28 - 28¼	27 - 27¼	.....	23¾ - 24	24 - 25⅝	24 - ..
" 27	29½ - ..	29¼ - 29½	28 - ..	28 - ..	24 - 24½	24 - 25½	.. ..
Sept. 3	30½ - ..	30½ 31	30 - 30½	.....	24¾ - 25	24 - 25½	25 - ..
" 10	.. - 31	31½ - 32	30 - 30½	28 - ..	25¼ - 25½	24 - 25½	26 - ..
" 17	.. - 32	32 - 32½	31 - ..	.....	26 - 26¼	24 - 25½	27 - ..
" 24	32 - ..	32 - 32½	31 - ..	28 - ..	27½ - 28	24 - 25½	27 - ..
Oct. 1	31 - ..	30½ - 31	30½ - ..	.....	28 - 28½	26 - 26½	28½ - ..
" 8	.. - 31½	31 - 31½	30½ - ..	29 - 30	27¼ - 27¾	26 - 26½	28½ - ..
" 15	.. - 31	30½ - 31	29 - ..	.....	27¼ - 27¾	26 - 26½	28 - 28½
" 22	31 - ..	31½ - 32	30 - ..	29 - 30	27 - 27¾	26 - 26½	28 - 28½
" 29	31½ - ..	32 - 33	31 - ..	27½ - 27¼	27½ - 27⅝	26 - 26½	28 - 28½
Nov. 5	31½ - ..	32 - 33	31½ - ..	29 - 30	27¼ - 28¼	26 - 26½	29½ - 30
" 12	32 - ..	34 - 35	31 - ..	.....	28 - 28½	26½ - 27	29½ - 30
" 19	32 - ..	34 - 35	32 - ..	30 - 31	28 - 28½	27 - 28	30 - 30½
" 26	32 - ..	33 - 35	32 - ..	.....	28 - 28½	28 29	30 - 30½
Dec. 3	32½ - ..	34 - 35	33 - ..	30 - 31	28 - 28½	28 - 29	.....
" 10	33½ - ..	35½ - 37	34 - ..	.....	28½ - 29	28 - 29	30 - 30½
" 17	34 - ..	36 - 37	35½ - ..	30 - 31	28½ - 29	28 - 29	30 - 30½
" 24	34 - ..	36½ - 37½	36 - ..	.....	28½ - 29	28 - 29	30 - ..
" 31	.. - 35	36½ - 37½	35½ - 36	30 - 31	28 - 28¾	28 - 30	30 - ..
1914.							
Jan. 7	34½ - ..	36½ - 37	34½ - 35	.....	28 - 28¾	28 - 29	.....
" 14	33½ - ..	33 - 33½	32½ - ..	30 - 31	28 - 28¾	28 - 29	29½ - ..
" 21	32 - ..	30½ - 31	30 - ..	.....	28 - 28¾	28 - 29	29½ - ..
" 28	.. - 30	28 - 28½	27½ - ..	30 - 31	28½ - 29	28 - 29	28½ - ..
Feb. 4	28 - ..	27 - 27½	26½ - ..	.....	28½ - 29	28 - 29	28 - ..
" 11	28 - ..	28 - 28½	27½ - ..	31 - 32	28½ - 29	28 - 29	27½ - 28
" 18	29½ - ..	30½ - ..	29½ - ..	.....	28½ - 29	28 - 29	.....
" 25	30 - ..	31 - 31½	29½ - 30	30 - 31	28½ - 29	28 - 29	27½ 28
March 4	30 - ..	31½ - 32	30 - ..	.....	27½ - 28	28 - 29	28 - ..
" 11	.. - 29	28 - 29	27 - ..	29 - 30	27½ - 28	28 - 29	28½ - ..
" 18	.. - 26	24½ - 25	24½ - ..	.....	27½ 28	26 - 27	28½ - ..
" 25	26 - ..	26 - 26½	.. - 25	29 - 30	27½ - 28	26 - 27	30½ - ..

WHOLESALE QUOTATIONS FOR CHEESE each week from April 2, 1913, to March 25, 1914.

(From "Boston Chamber of Commerce," "Producers' Price Current," "Daily Trade Bulletin," "Maritime Merchant," "Journal of Commerce," "Farm and Dairy," and Winnipeg 'Free Press.')

Week.	Boston.	New York.	Chicago.	Halifax.	Montreal.	Toronto.	Winnipeg.
	"N. Y. Twins.	Whole Milk "Fancy coloured."	"Twins."	"Westerns."	"Westerns."	"Westerns."	"Westerns."
1913.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.
April 2	17 - 17½	16 - 16½	13 - ..	.....	12¾- 13	15 - ..	.....
" 9	16½- ..	16 - 16½	13 - ..	14½- 15	12 - 13	15 - ..	14½- 15
" 16	16½ ..	16 - 16½	13 - ..	.....	12 - 13	15 - ..	.....
" 23	.. - 16½	16 - 16½	13 - ..	13 - ..	12 - 13	15 - ..	14½- 15
" 30	16 - 16½	13 - ..	13 - 13½	....	12 - 13	15 - ..	14½- 15
May 7	16 - 16½	12½- 13½	13 - ..	13 - ..	11 - 11¼	13 - 13½	13 - 14
" 14	.. - 17	12¼- 12½	13 - ..	.....	11 11¼	13 - 13½	13 - 14
" 21	14 - ..	13 - ..	12 - 12½	13 - ..	11 11½	13 - 13½	13 - 14
" 28	14½ ..	13¾- ..	13 - ..	.. ..	12 - 12¾	13 - 13½	13 - 14
June 4	14½ - 14¾	14 - ..	13½- 14	13 - ..	12 - ..	13 - 13½	13½- 14¼
" 11	14¾- 15	14½- ..	13½- 14	.....	12 - 12½	13½- 14	13 - 13½
" 18	14¾- 15	14½- ..	14 - 14½	13 - ..	12 - 12¾	13½- 14	13 - 13½
" 25	14¾ 15	14¾ - 14½	14 - ..	....	12 - 12½	13½- 14	13½- 14
July 2	14¾ - 15	.. - 14	13½- 14	14 - ..	13 - 13½	13½ 14	14 - 14½
" 9	14½- .	13¾- 14	13 - 13½	... .	13⅛ 13¼	13½- 14	14 - 14½
" 16	14¾ ..	13¾- 14	13 - ..	14 - ..	13⅜- 13½	14¼- 14¾	14 - 14½
" 23	14½ - 14¾	.. - 14	13 - ..	.....	13½- 13⅝	14½- 14¾	14 - 14½
" 30	14½ - 14¾	13¾- 14	13 - ..	14 - ..	13¾- 13¾	14½- 14¾	13½- 14
Aug. 6	14½ 14¾	13¾- 14	13 - ..	.....	13⅜- 14½	14½ 14¾	....
" 13	14¾- 15	14 - 14¼	13 - ..	14 - ..	13½- 13¾	14½ 14¾	13½- 14
" 20	15 - 15¼	14¾- ..	13 - 13¼	... .	13⅜ 13½	14½- 14¾	13½- 14
" 27	15½- 15¾	15 - ..	13½- 14	14 - ..	13 13½	14½- 14¾	.....
Sept. 3	16 - 16¼	15¼- 15½	13½- 14	.....	13⅛ 13¼	14½- 14¾	14 - 14½
" 10	16 - 16½	15½ 15¾	13½- 14	14¼- ..	13¼- 13⅜	14⅜- 14¾	14½- 14¾
" 17	16½- 16¾	15⅜ ..	13½- 14	.....	13½- 13⅜	14⅜- 15¼	14½- 14¾
" 24	17 - ..	15¾- 16	14 - 14½	14¾- ..	13¼- 13½	14⅜ 15¼	15 - 15½
Oct. 1	.. - 17	16 - 16¼	15 - 15½	.....	13⅜- 13½	14¾ 15¼	15 - 15½
" 8	16¾- 17	16½- ..	15 - 15½	15 - 15½	13 - 13½	14½- 14¾	14 - 14½
" 15	16¾- 17	16 - ..	14 - 14½	.....	13 - 13½	14½ 14⅜	14 - 14½
" 22	16 - 16½	15½- ..	14 - ..	15 - 15½	13 - 13¼	14¼ 14¾	14½- 15
" 29	16½ 16⅜	15¼- ..	14 - ..	.....	13¼- 13½	14½- 14⅜	14½- 15
Nov. 5	16½ 16¾	15½- ..	14 - ..	15 - ..	13⅛- 13¼	14½- 14¾	14½- 15
" 12	16½ 16¾	15⅜ 16	14 - ..	.....	13½ 13⅜	14¼ 14¾	14½- 15
" 19	16¾ 17	16½- ..	14 - ..	15 - ..	13½- 13⅜	14½ 14⅜	14½- 15½
" 26	16¾ 17	16¼- ..	14 - 14½	....	13½- 13⅜	14⅜ 15	14¾- 15½
Dec. 3	16¾ 17	16 16¾	14 - 14½	15 - 15½	13½- 13⅜	14⅜ 15	14⅜- 15½
" 10	16¾ 17	16 - 16¾	14 - 14½	....	13½- 13⅜	13⅜- 15	14⅜- 15½
" 17	16¾ 17	16½- 16½	14 - 14½	15 - 15½	13⅜- 13¾	14⅜ 15	14⅜- 15¼
" 24	17 17¼	16¾ 16⅜	14½- 15½	....	13¼- 13⅜	14¼- 15	14⅜- 15¼
" 31	17 - 17½	16⅜- ..	15½- 16½	15 - 15½	13½- 13⅜	.. - 15	15 - 15½
1914.							
Jan. 7	.. 17½	16¼- 17	16½- ..	.....	13½- 13⅜	15 - 15½	.....
" 14	17½ 17¾	17 - 17¼	16 - 17	15 - 15½	13½- 13⅜	15 - 15½	15¼- 15¾
" 21	17½ 18	17¼- 17½	16 - 17	.....	13½- 13⅜	15 - 15½	15¼- 15¾
" 28	18 - ..	17½- 17⅜	16 - 17	15 - 15½	13½- 13⅜	15 - 15½	15⅜- 15¾
Feb. 4	18 - 18½	17½- 17¾	16 - 17	.....	13½- 13⅜	15 - 15½	15⅜- 15¾
" 11	18½ 18½	17¼ 17⅜	16 - 17	15 - 15½	13½ 13⅜	15 - 15½	15½- 16
" 18	18½ 18½	17¼ 17⅜	16 - 17	.....	13½- 13⅜	15 - 15½	15½ 16
" 25	18½ 18½	17¼ 17¾	16 - 16½	15½ 16	13½ 13⅜	15½ ..	15½ 16
Mar. 4	18½ 18½	17½- 18	16 - 16½	.....	13½- 13⅜	15½- ..	15½ 16
" 11	.. - 18½	17¾ 18⅜	16 - 16½	16½- 17	13½ 13⅜	15½- ..	15⅜- 16¼
" 18	18½- 19	18½- 18¾	16 - 16½	.....	13½- 13⅜	16 - 16¼	15⅜- 16¼
" 25	18¾- 19	18½ 18¾	16½- 16½	16½- 17	13½- 13⅜	16 - 16¼	15¾ 16¼

SESSIONAL PAPER No. 15a

WHOLESALE QUOTATIONS FOR EGGS each week from April 2, 1913, to March 25, 1914.

(From "Boston Chamber of Commerce," "Producers Price Current," "Daily Trade Bulletin," "Maritime Merchant," "Journal of Commerce," "Farm and Dairy," and "Winnipeg Free Press.")

Week.	Boston.	New York.	Chicago.	Halifax.	Montreal.	Toronto.	Winnipeg.
	"Western Firsts."	"Firsts."	"Firsts."	"Fresh."	"Fresh."	"Fresh."	"Fresh."
1913.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.
April 2....	18½- 19	18¼- 18½	16¾- 17	.. ..	18 - 20	22 - 23	.....
" 9....	.. - 19½	.. - 20	17¾- 18¼	.. - 22	.. - 21	21 - 22	.. - 23
" 16....	.. - 19	19½- 20½	17¼- 17½	.....	.. - 21	21 - 22	.....
" 23....	.. - 19½	19½- 20½	17¼- 17¾	20 - 22	.. - 20	20 - 21	.. - 20
" 30....	19½- 20	20 - 21	17½- 18	.. ..	.. - 20	20 - 21	.. - 20½
May 7....	20 - 20½	19 - 19½	17½- 17¾	.. - 18	.. - 19	20 - 21	.. - 20½
" 14....	.. - 21	20 - 20½	18 - 18½	....	.. - 19	20 - 21	.. - 20
" 21	21 - 21½	20 - 20½	18¼- 18¾	.. - 19	.. - 20	20 - 21	.. - 21
" 28....	21 - 21½	20 - 20½	18¼- 18¾	.....	21 - 22	20 - 21	.. - 21
June 4	.. - 20½	19 - 19½	17½- 18	.. - 20	23 - 25	20 - 21	. - 20½
" 11....	20 - 20½	19 - 19½	17½- 18	....	22 - 23	21 - 22	.. - 20½
" 18....	20 - 20½	19 - 20	16 - 16¼	. - 20	.. - 22	21 - 22	.. - 20½
" 25....	.. - 19	18½- 19½	17¼- 17¾	.....	.. - 22	21 - 22	.. - 20½
July 2	.. - 18	18 - 19	17¼- 17¾	.. - 22	.. - 22	21 - 22	.. - 20½
" 9....	.. - 18	18 - 20	16½ 16¾	.....	23 - 24	21 - 22	.. - 20½
" 16....	.. - 18	18½- 20	16 - 16½	.. - 22	23 - 24	20 - 21	.. - 20½
" 23....	.. - 18	19 - 20	17¼- 17½	.....	.. - 27	20 - 21	.. - 20½
" 30....	19 - 20	20 - 21	.. - 19	.. - 22	.. - 27	20 - 21	.. - 23
Aug. 6....	.. - 21	21 - 22	19 - 19½	.....	.. - 27	20 - 21	.....
" 13....	22 - 23	23 - 24	20 - 21	.. - 24	.. - 27	20 - 21	.. - 23
" 20....	23 - 24	24 - 25	21½- 22	....	.. - 27	20 - 21	.. - 22
" 27....	24 - 25	24 - 25	22½- 23	.. - 25	.. - 29	22 - 24	.....
Sept. 3....	26 - 27	24 - 25	22½- 23	... .	.. - 29	23 - 25	.. - 25
" 10....	27 - 28	25 - 27	2 - 23½	.. - 25	.. - 29	23 - 25	.. - 26
" 17....	26 - 28	27 - 29	23½- 24	....	.. - 30	23 - 25	.. - 26
" 24....	27 - 28	28 - 30	25 - 25½	.. - 27	.. - 32	23 - 25	.. - 26
Oct. 1. ..	28 - 30	27 - 29	25 - 26	.....	.. - 32	27 - 28	.. - 27
" 8 ...	28 - 30	28 - 30	25 - 26	.. - 29	29 - 31	28 - 30	.. - 27
" 15....	28 - 30	28 - 30	25 - 26	. . ..	30 - 32	28 - 30	.. - 27
" 22....	28 - 30	29 - 30	29½- 30½	.. - 31	.. - 32	30 - 32	.. - 27
" 29....	28 - 31	30 - 32	29½- 30½	.....	.. - 32	30 - 32	.. - 27
Nov. 5....	32 - 33	33 - 34	30 - 31	.. - 31	33 - 34	30 - 32	.. - 27
" 12	35 - 40	40 - 42	30 - 32	. . ....	34 - 35	30 - 32	.. - 27
" 19....	38 - 42	39 - 41	34 - 34½	.. - 32	35 - 36	30 - 32	.. - 27
" 26....	40 - 43	42 - 43	34 - 35	.. ..	37 - 38	34 - 35	.. - 28
Dec. 3....	40 - 43	42 - 43	36 - 37	38 - 40	37 - 38	34 - 35	.....
" 10....	38 - 40	35 - 36	31 - 31½	.. ..	37 - 38	36 - 37	.. - 32
" 17....	34 - 35	33 - 34	30½- ..	38 - 40	37 - 38	36 - 37	.. - 32
" 24....	34 - ..	33½- 34	31½- ..	.....	37 - 38	35 - 36	.. - 32
" 31....	.. - 35	35½- 36	32¾- 33	38 - 40	37 - 38	.. - 37	.. - 34
1914.							
Jan. 7....	34 - ..	33½- 34	32 - ..	....	37 - 38	35 - 36	....
" 14....	34 - ..	34 - 35	32 - ..	34 - 35	37 - 38	.. - 37	.. - 37
" 21....	.. - 32	31 - 32	31 - ..	.....	37 - 38	36 - 38	.. - 37
" 28....	32 - 33	31½- 32	29 - ..	34 - 35	35 - 36	36 - 38	.. - 37
Feb. 4....	31 - ..	29½- 30	26½- 26½	.....	35 - 36	36 - 38	.. - 35
" 11 ..	29 - ..	27 - 27½	26½- ..	35 - 36	35 - 36	36 - 38	.. - 34
" 18....	30 - ..	29½- 30	26 - ..	.....	35 - 36	34 - 35	....
" 25....	28 - 29	29½- 30	26 - ..	35 - 36	35 - 36	33 - 34	.. - 32
March 4....	.. - 31	32 - 33	29 - 29¼	.....	30 - 31	33 - 34	.. - 30
" 11....	.. - 30	.. - 30	26½- 26¾	30 - 33	30 - 31	33 - 34	.. - 30
" 18....	.. - 21	20½- 21	18½- ..	.....	30 - 31	34 - 35	.. - 20
" 25....	19 - ..	20 - 20½	17½- 17¾	24 - 25	30 - 31	26 - ..	.. - 18

NOTE.—In the Canadian markets "Selected Cold Storage" is the grade quoted after the close of the producing season.

WHOLESALE QUOTATIONS FOR BREAKFAST BACON each week from April 2, 1913, to March 25, 1914.

(From "Canadian Farm," "National Provisioner," and "The Grocer," London.)

Week.	New York.	Chicago.	Montreal.	Toronto.	Winnipeg.	London, Eng.
	Breakfast Bacon.	Breakfast Bacon.	Breakfast Bacon.	Breakfast Bacon.	Breakfast Bacon.	Canadian Bacon Leanest (Landed).
1913	Cts.	Cts.	Cts.	Cts,	Cts.	Cts.
April 2	18½ - 19	17¾ - 20½	21 - 22	19 - 19½	19 - 20	15.8 - 16.0
" 9	18½ - 19	18 - 21	21 - 22	19½ - 20	19 - 20	15.8 - 16.0
" 16	.. - 19	18 - 21	21 - 22	19½ - 20	19 - 20	15.8 - 16.0
" 23	.. - 19	18 - 21½	21 - 22	19½ - 20	19 - 20	15.8 - 16.0
" 30	.. - 19	18 - 21½	21 - 22	19½ - 20	19 - 20	16.0 - 16.5
May 7	.. - 19	18 - 21½	21 - 22	19½ - 20	19 - 20	16.9 - 17.1
" 14	19 - 20	18 - 21½	22 - 23	19½ - 20	19 - 20	16.9 - 17.1
" 21	19 - 20	18¾ - 21¾	22 - 23	19½ - 20	19 - 20	16.5 - 17.1
" 28	19 - 20	18¾ - 21¾	22 - 23	19½ - 20	20 - 21	16.2 - 16.9
June 4	20 - 21	18¾ - 22¼	22 - 23	19½ - 20	20 - 21	16.0 - 16.7
" 11	20 - 21	18¾ - 22¼	20 - 22	19½ - 20	20 - 21	16.0 - 16.7
" 18	20 - 21	18¾ - 22¼	20 - 22	20 - 21	20 - 21	16.0 - 16.7
" 25	20 - 21	18¾ - 22¼	20 - 22	20 - 21	20 - 21	16.2 - 16.7
July 2	20 - 21	18¾ - 22¼	20 - 22	20 - 21	20 - 21	16.5 - 17.1
" 9	20 - 21	18¾ - 22½	20 - 22	20 - 21	20 - 21	16.5 - 16.1
" 16	20 - 21	18¾ - 22½	20 - 22	20 - 21	20 - 21	16.7 - 16.9
" 23	20 - 21	18¾ - 22½	20 - 22	20 - 21	20 - 21	16.9 - 17.5
" 30	20 - 21	18¾ - 22½	20 - 22	20 - 21	20 - 21	18.2 - 18.4
Aug. 6	19 - 20	18¾ - 22	20 - 22	21 - 22	20 - 21	18.2 - 18.4
" 13	18½ - 19½	18¾ - 22	20 - 22	21 - 22	20 - 21	16.9 - 17.8
" 20	18½ - 19½	18¾ - 22	20 - 20½	21 - 22	19 - 21	16.5 - 16.9
" 27	18½ - 19½	18¼ - 21½	22 - 25	21 - 22	19 - 21	16.2 - 16.9
Sept. 3	18½ - 19½	18¼ - 21½	22 - 25	19 - 20	19 - 21	16.2 - 16.9
" 10	18½ - 19½	18¼ - 20¾	22 - 25	19 - 20	19 - 21	16.5 - 16.9
" 17	.. - 18	17¾ - 19½	20 - 23	19 - 20	19 - 21	16.5 - 16.9
" 24	.. - 18	17¾ - 19½	20 - 23	19 - 20	19 - 20	17.3 - 17.8
Oct. 1	.. - 18	17¾ - 19½	20 - 23	19 - 20	19 - 21	17.3 - 17.8
" 8	.. - 18	17½ - 19½	20 - 23	19 - 20	19 - 21	16.0 - 16.7
" 15	.. - 18	17½ - 19½	20 - 23	19 - 20	19 - 21	16.0 - 16.7
" 22	.. - 18	17½ - 19½	19 - 22	19 - 20	19 - 21	15.2 - 15.6
" 29	.. - 18	17½ - 19½	17 - 19	19 - 20	19 - 21	14.5 - 14.9
Nov. 5	.. - 18	17½ - 19½	17 - 19½	19 - 20	19 - 21	14.5 - 14.9
" 12	.. - 18	17½ - 19½	17 - 19	19 - 20	19 - 21	14.5 - 14.9
" 19	.. - 18	17½ - 19½	17 - 19	19 - 20	19 - 21	14.7 - 15.3
" 26	.. - 18	17½ - 18¾	18 - 19	19 - 20	19 - 21	14.7 - 15.3
Dec. 3	.. - 18	17½ - 18¾	18 - 19	19 - 20	19 - 21	14.7 - 15.3
" 10	.. - 18	17 - 18	17 - 19	19 - 21	19 - 21	14.5 - 15.2
" 17	.. - 17½	17 - 18	17 - 19	19 - 20	19 - 20	14.5 - 15.2
" 24	.. - 17½	17 - 18	18½ - 19	19 - 20	19 - 20	14.5 - 15.2
" 31	.. - 17½	16½ - 17½	18½ - 19	18 - 19	20 - 21½	14.5 - 15.2
1914						
Jan. 7	.. - 17½	16½ - 17⅞	18½ - 19	18 - 19	19 - 20	14.5 - 15.2
" 14	.. - 18	16½ - 17½	18½ - 19	18 - 19	19 - 19½	14.7 - 15.3
" 21	.. - 18	16½ - 17½	18½ - 19	18 - 19	19 - 19½	14.7 - 15.3
" 28	.. - 18	16½ - 17⅞	18½ - 19	18 - 19	19 - 19½	14.7 - 15.3
Feb. 4	.. - 18	16½ - 17½	18½ - 19	18 - 19	19 - 19½	15.2 - 15.6
" 11	.. - 18	16½ - 17½	18½ - 19	18 - 19	19 - 19½	14.7 - 15.6
" 18	.. - 18	17 - 18½	18½ - 19	18 - 19	19 - 19½	14.1 - 14.9
" 25	.. - 18	17½ - 18½	18½ - 19	18 - 19	19 - 19½	13.9 - 14.3
Mar. 4	.. - 18	17½ - 18½	18½ - 19	18 - 19	19 - 19½	14 1 - 14.3
" 11	.. - 18	17¾ - 18½	18½ - 18	18 - 19	19 - 19½	14.5 - 14.9
" 18	.. - 18	17¾ - 18½	18½ - 19	18½ - 19	19 - 20	16.3 - 16.7
" 25	.. - 18	17½ - 19½	18½ - 19	18½ - 19	19 - 20	16.3 - 16.7

NOTE.—London quotations represent green bacon; for smoked bacon add one cent a pound.

SESSIONAL PAPER No. 15a

WHOLESALE QUOTATIONS FOR DRESSED BEEF (No. 1 Carcass) each week from April 2, 1913, to March 25, 1914.

(From "Canadian Farm," and "National Provisioner.")

Week.	New York.	Chicago.	Montreal.	Toronto.	Winnipeg.	Calgary.
1913.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.
April 2.....	13 - 13½	13¼- 13½	11 - 12	11 - 11½	11 - 11½	13 - 13½
" 9.....	13 - 13½	13¼- 13½	11 - 12	11 - 11½	11 - 11½	13 - 13½
" 16.....	.. - 13½	13¼- 13½	11 - 12	11 - 11½	11 - 11½	13 - 13½
" 23.....	.. - 13½	13¼- 13½	11 - 12	11 - 11½	11 - 11½	13 - 13½
" 30.....	.. - 13½	13¼- 13½	11 - 12	10½- 11½	11 - 11½	13 - 13½
May 7.....	.. - 13	13¼- 13¾	11 - 12	10½- 11½	11½- 12	13¼- 13½
" 14.....	.. - 12½	13¼- 13¾	11 - 12	10½- 11½	11½- 12	13¼- 13½
" 21.....	.. - 12½	13¼- 13½	11 - 12	10¾- 11½	11½- 12	13 - 13¼
" 28.....	12½- 13	13¼- 13½	11 - 12	10¾- 11½	11½- 12	13 - 13½
June 4.....	12½- 13	13¼- 13½	11 - 12	11 - 12	11½- 12	13 - 13½
" 11. .	13 - 13½	13¼- 13½	11 - 12	11 - 12	12½- 13	13 - 13½
" 18.....	13 - 13½	13¼- 13½	11 - 12	11 - 12	13½- 13	13 - 13½
" 25.....	13 - 13½	13¼- 13½	11 - 12	11 - 12	12½- 13	13 - 13½
July 2.....	.. - 13	13¼- 13½	11 - 12	11 - 12	12½- 13	13 - 13½
" 9.....	13½- 14	13¼- 13½	11 - 12	10½- 11½	12½- 13	13 - 13½
" 16.....	13½- 14	13¼- 13½	11 - 12	10½- 11½	12½- 13	13 - 13½
" 23.....	13½- 14	13 - 13¼	11 - 11¾	10¼- 11¼	12½- 13	13 - 13½
" 30.....	13½- 14	13 - 13½	11 - 11¾	10¼- 11¼	12½- 13	13 - 13¼
Aug. 6.....	13½- 14	13 - 13½	11 - 11¾	10¼- 11¼	12½- 13	13¼- 13½
" 13.....	13½- 14	13 - 13½	11 - 11¾	10¼- 11¼	12½- 13	13¼- 13½
" 20.....	13½- 14	13 - 13½	11 - 11¾	10¼- 11¼	12½- 13	13¼- 13½
" 27.....	13½- 14	13 - 13¼	11 - 11¾	10¼- 11	11½- 12	13¼- 13½
Sept. 3.....	13 - 13½	13 - 13¼	11 - 11¾	10¼- 11	11½- 12	13¼- 13½
" 10.....	13 - 13½	13 - 13¼	11 - 11¾	10¼- 11	9¾- 10	13¼- 13½
" 17.....	13½- 14	13¼- 13½	11 - 11¾	10½- 11	9¾- 10	13¼- 13½
" 24.....	13½- 14	13¼- 13½	11 - 11¾	10¼- 11	9¾- 10	13¼- 13½
Oct. 1.....	13½- 14	13¼- 13½	11 - 11¾	10¼- 11	9¾- 10	13¼- 13½
" 8.....	13½- 14	13¼- 13½	11 - 11¾	11 - 11½	9¾- 10	13¼- 13½
" 15.....	13½- 14	13¼- 13½	11 - 11¾	11 - 11½	10½- 11	13¼- 13½
" 22.....	13½- 14	13¼- 13½	11 - 11¾	11 - 11½	10½- 11	13¼- 13½
" 29.....	13½- 14	13¼- 13½	11 - 11¾	11 - 12	10½- 11	13¼- 13½
Nov. 5.....	13½- 14	13¼- 13½	11 - 11¾	11 - 12	10½- 11	13¼- 13½
" 12.....	13½- 14	13¼- 13½	11 - 11¾	11 - 12	10½- 11	13½- 13½
" 19.....	.. - 13½	13¼- 13½	11 - 11¾	11 - 12	10½- 11	13¼- 13½
" 26.....	.. - 13	13¼- 13¾	11 - 11¾	11 - 12	11 - 12	13¼- 13¾
Dec. 3.....	.. - 13	13¼- 13½	11 - 11¾	11 - 12	11 - 11½	13¼ 13½
" 10.. ..	.. - 13	13¼- 13½	11 - 11¾	12½- 13½	11 - 11¾	13¼- 13¼
" 17.....	.. - 13	13¼- 13½	11 - 11¾	12½- 13½	11 - 11¾	13¼- 13½
" 24.....	.. - 13	13¼- 13½	12 - 13	13 - 14	11 - 11¾	13½- 13¾
" 31. ...	.. - 13	13½- 14	13 - 13½	13 - 14	9¾- 10	13½- 13¾
1914.						
Jan. 7.....	.. - 13½	13¼- 13½	13 - 13½	13 - 14	11¾- 13	13½- 13¾
" 14.....	13½- 14	13¼- 13½	13 - 13½	13 - 14	11¾- 11½	13½- 13¾
" 21.....	14 - 14½	13 - 13¼	13 - 13½	13½- 14½	12¾- 12½	13½- 13¾
" 28	13 - 13½	13 - 13¼	13 - 13½	14 - 15	12¾- 12½	13½- 13¾
Feb. 4... ..	.. - 13	13¼- 13½	13 - 13½	14 - 15	12¾- 12½	13½- 13¾
" 11.....	.. - 13½	13¼- 13½	13 - 13½	13 - 15	12¾- 12½	13½- 13¾
" 18.....	.. - 13½	13¼- 13½	13 - 13½	13½- 14½	12¾- 12½	13½- 13¾
" 25.....	.. - 13½	13¼- 13½	13 - 13½	13½- 14	12¾- 13	13 - 13½
Mar. 4.....	.. - 13½	13¼- 13½	13 - 13½	13½- 14	12¾- 12½	13 - 13½
" 11.....	.. - 13	13¼- 13½	13 - 13½	13½- 14	12¾- 12½	13 - 13½
" 18.....	.. - 13	13½- 14	13 - 13½	13 - 13½	11¾- 12	13 - 13½
" 25.....	.. - 13	13½- 14	13 - 13½	13 - 13½	11¾- 12	13 - 13½

WHOLESALE QUOTATIONS FOR LIVE HOGS each week from April 2, 1913 to March 25, 1914.

Week.	New York.	Buffalo.	Chicago.	Montreal.
	"Medium weight."	"Yorkers."	"Choice" 160-190 lbs.	"Choice."
1913.	$	$ F. and W.	$ F. and W.	$ W. O. C.
April 2	.... - 10.55	10.90 - 11.00	9.40 - 9.50	..... - 10.75
" 9	9.90 - 10.00	9.50 - 9.60	9.25 - 9.40	.... - 10.50
" 16	9.65 - 9.75	9.60 - 9.70	9.25 - 9.40	10.25 - 10.50
" 23	9.65 - 9.75	9.50 - 9.65	9.15 - 9.25	..... - 10.35
" 30	9.25 - 9.35	9.55 - 9.60	8.70 - 8.85	..... - 10.50
May 7	.... - 9.00	8.80 - 9.05	8.55 - 8.60	..... - 10.50
" 14	.... - 9.00	8.85 - 8.90	8.40 - 8.50	..... - 10.50
" 21	.... - 9.20	8.85 - 8.90	8.50 - 8.65	..... - 10.75
" 28	.... - 9.20	8.80 - 9.00	8.65 - 8.70	..... - 10.75
June 4	.... - 9.20	.... - 9.00	8.75 - 8.80	..... - 10.75
" 11	.... - 9.20	9.05 - 9.10	8.55 - 8.65	..... - 10.75
" 18	.... - 9.20	9.20 - 9.25	8.85 - 8.95	..... - 10.75
" 25	.... - 9.20	9.05 - 9.10	8.75 - 8.80	..... - 10.00
July 2	.... - 9.30	9.05 - 9.10	8.75 - 8.85	10.40 - 10.50
" 9	.... - 9.70	9.35 - 9.40	9.05 - 9.20	10.40 - 10.50
" 16	.... - 9.90	9.65 - 9.70	9.15 - 9.25	10.40 - 10.50
" 23	.... - 10.10	9.85 - 9.90	9.40 - 9.60	..... - 10.75
" 30	.... - 10.10	9.90 - 9.95	9.35 - 9.50	..... - 11.00
Aug. 6	.... - 9.85	8.90 - 8.95	9.20 - 9.32½	..... - 11.00
" 13	.... - 9.70	9.65 - 9.75	9.10 - 9.35	..... - 10.10
" 20	.... - 9.50	9.10 - 9.35	8.75 - 9.00	10.40 - 10.50
" 27	.... - 9.80	9.40 - 9.75	9.00 - 9.25	..... - 10.65
Sept. 3	.... - 9.55	8.75 - 9.10	8.60 - 8.75	..... - 10.65
" 10	.... - 10.05	9.25 - 9.75	9.10 - 9.40	..... - 10.40
" 17	.... - 9.80	8.75 - 9.10	8.75 - 9.00	..... - 10.40
" 24	.... - 9.50	9.00 - 9.50	9.00 - 9.25	..... - 10.10
Oct. 1	.... - 9.40	8.50 - 9.40	8.85 - 9.00	..... - 9.75
" 8	.... - 9.20	8.50 - 8.75	8.70 - 8.90	..... - 8.75
" 15	.... - 9.00	8.50 - 8.75	8.55 - 8.75	..... - 9.00
" 22	.... - 8.80	8.25 - 8.40	8.55 - 8.75	..... - 9.50
" 29	.... - 8.80	8.30 - 8.40	8.00 - 8.25	..... - 10.00
Nov. 5	.... - 8.80	7.90 - 8.25	8.00 - 8.10	..... - 9.75
" 12	.... - 8.90	.....	7.90 - 8.15	..... - 9.50
" 19	.... - 8.60	8.15 - 8.20	7.60 - 7.85	..... - 9.50
" 26	.... - 8.50	7.95 - 8.00	7.50 - 7.60	..... - 9.50
Dec. 3	.... - 8.40	8.05 - 8.10	7.55 - 7.65	..... - 9.25
" 10	.... - 8.50	7.90 - 7.95	7.55 - 7.75	..... - 9.25
" 17	.... - 8.50	7.75 - 7.80	7.50 - 7.70	..... - 9.25
" 24	.... - 8.50	8.05 - 8.10	7.50 - 7.65	..... - 9.50
" 31	.... - 8.80	8.60 - 8.75	7.70 - 7.90	..... - 9.75
1914.				
Jan. 7	.... - 8.90	8.70 - 8.75	8.05 - 8.20	..... - 9.75
" 14	.... - 8.90	8.60 - 8.65	8.15 - 8.20	..... - 9.75
" 21	.... - 8.90	8.70 - 8.75	8.20 - 8.40	..... - 10.00
" 28	.... - 8.90	8.65 - 8.70	8.20 - 8.35	..... - 9.75
Feb. 4	.... - 9.10	8.95 - 9.00	8.40 - 8.60	..... - 9.75
" 11	.... - 9.60	9.35 - 9.40	8.50 - 8.65	9.60 - 9.90
" 18	.... - 9.60	9.20 - 9.30	8.55 - 8.70	9.85 - 10.00
" 25	.... - 9.70	9.25 - 9.35	8.60 - 8.75	..... - 10.25
Mar. 4	.... - 9.70	9.10 - 9.15	8.55 - 8.70	..... - 10.20
" 11	.... - 9.70	9.10 - 9.15	8.60 - 8.80	..... - 10.00
" 18	.... - 9.45	9.15 - 9.30	8.70 - 8.85	..... - 9.25
" 25	.... - 9.65	9.35 - 9.40	8.75 - 8.85	9.85 - 10.00

NOTE - "F. and W." means "fed and watered"; "W. O. C." means "weighed off cars." Therefore to make a fair comparison 25 cents should be deducted from the latter quotations.

SESSIONAL PAPER No. 15a

WHOLESALE QUOTATIONS FOR LIVE HOGS each week from April 2, 1913 to March 25, 1914

Week.	Toronto.	Winnipeg.	Calgary.
	"Choice."	"Choice."	"Choice."
1913.	$ F. and W.	$ W. O. C.	$ W. O. C.
April 2	9.85 - 10.00	.. - 8.50	.. - 8.50
" 9	9.50 - 9.60	.. - 8.50	.. - 8.50
" 16	9.35 - 9.50	.. - 8.75	.. - 8.50
" 23	9.45 - 9.50	.. - 8.75	.. - 8.50
" 30	9.65 - 9.75	.. - 9.00	.. - 8.50
May 7	9.70 - 9.75	.. - 9.25	.. - 8.75
" 14	9.80 - 9.85	.. - 9.00	.. - 8.75
" 21	9.80 - 9.85	.. - 9.75	.. - 8.75
" 28	9.80 - 9.85	.. - 9.00	.. - 8.75
June 4	10.00 - 10.10	.. - 9.00	.. - 8.75
" 11	10.00 - 10.10	.. - 9.00	.. - 8.75
" 18	10.10 - 10.15	. - 9.00	.. - 8.75
" 25	9.40 - 9.50	.. - 9.00	.. - 8.75
July 2	9.00 - 9.25	.. . 9.00	.. - 8.75
" 9	8.90 - 9.15	.. - 8.50	.. - 8.75
" 16	9.50 - 9.60	.. - 8.50	.. - 8.75
			F. and W.
" 23	10.00 - 10.15	.. - 8.75	.. - 8.00
" 30	10.15 - 10.25	.. - 8.75	.. - 8.00
Aug. 6	10.15 - 10.25	.. - 9.00	.. - 7.25
" 13	10.15 - 10.25	.. - 8.00	.. - 8.00
" 20	10.15 - 10.25	.. - 9.25	.. - 8.50
" 27	9.90 - 10.00	.. - 9.25	.. - 8.50
Sept. 3	9.90 - 10.00	.. - 9.25	.. - 8.50
" 10	9.65 - 10.00	.. - 9.25	.. - 8.50
" 17	10 00 -	.. - 9.25	.. - 8 50
" 24	9.50 -	.. - 9.00	.. - 8.50
Oct. 1	9.10 -	.. - 9.00	.. - 8.50
" 8	8.85 - 9.00	.. - 9.00	.. - 8.50
" 15	..... - 8.60	.. - 9 00	.. - 8.50
" 22	. ... - 9.00	.. - 8.75	.. - 8.50
" 29	..... - 9.00	.. - 8.50	.. - 8 25
Nov. 5	..... - 9.20	.. - 8.25	.. - 8.00
" 12	..... - 8.60	.. - 8.25	.. - 7.75
" 19	8.90 - 9.10	.. - 8.25	.. - 7.75
" 26	..... - 8.50	.. - 8.00	.. - 8.00
Dec. 3	8.50 - 8.60	.. - 8.00	.. - 8.00
" 10	8.10 - 8.25	.. - 7.75	.. - 7.00
" 17	8.35 - 8.55	.. - 7.75	.. - 7.00
" 24	8.65 - 8.75	.. - 7.50	.. - 6.75
" 31	9.00 - 9.25	.. - 7.50	.. - 6.75
1914.			
Jan. 7	9.00 - 9.25	.. - 7.50	.. - 6.75
" 14	9.00 - 9.25	.. - 7.85	.. - 6.75
" 21	9.10 - 9.25	.. - 8.00	.. - 7.00
" 28	..... - 9.00	.. - 8.00	.. - 7.00
Feb. 4	9.35 - 9.50	.. - 8 00	.. - 7.50
" 11	9.25 - 9.50	.. - 8.25	.. - 7.75
" 18	9.45 - 9.50	.. - 8.35	.. - 7.75
" 25	9.00 - 9.10	.. - 8.40	.. - 8.25
Mar. 4	9.10 - 9.25	.. - 8.40	.. - 8.25
" 11	9.10 - 9.25	.. - 8.65	.. - 8.25
" 18	9.10 - 9.25	.. - 8.65	.. - 8.20
" 25	9.00 - 9.25	.. - 8.35	.. - 8.50

Wholesale Quotations for Live Cattle each week from April 2, 1913, to March 25, 1914.

(From "Canadian Farm" and "National Provisioner.")

Week.	New York.	Buffalo.	Chicago.	Montreal.	Toronto.	Winnipeg.	Calgary.
	Good to Choice.	Good to Choice.	Good to Choice.	Good to Choice.	Good to Choice.	Good to Choice.	Good to Choice.
1913.	$	$	$	$	$	$	$
April 2	8.25 - 9.35	8.00 - 9.00	8.50 - 9.10	6.90 - 7.75	6.40 - 7.10	6.25 - 7.25	6.50 - 7.25
" 9	8.40 - 9.50	8.00 - 9.00	8.50 - 9.20	6.90 - 7.75	6.40 - 7.25	6.25 - 7.25	6.50 - 7.25
" 16	8.20 - 9.20	8.00 - 9.50	8.50 - 9.10	6.90 - 7.50	6.40 - 7.15	6.50 - 7.25	6.50 - 7.25
" 23	8.00 - 8.85	8.00 - 9.50	8.50 - 9.25	6.75 - 7.50	6.40 - 7.15	6.25 - 7.25	6.50 - 7.25
" 30	8.00 - 8.85	8.00 - 9.50	8.50 - 8.90	6.75 - 7.40	6.60 - 7.10	6.50 - 7.25	6.50 - 7.50
May 7	7.85 - 8.85	7.50 - 8.45	8.50 - 9.10	6.75 - 7.50	6.50 - 6.90	6.25 - 7.40	6.50 - 7.50
" 14	7.70 - 8.75	7.50 - 8.25	8.50 - 8.90	6.75 - 7.75	6.50 - 7.25	6.50 - 7.50	6.50 - 7.50
" 21	7.65 - 8.65	8.10 - 8.50	8.50 - 8.85	6.75 - 7.75	6.50 - 7.25	6.50 - 7.40	6.50 - 7.50
" 28	7.65 - 8.75	7.75 - 8.35	8.50 - 8.75	6.75 - 7.75	6.50 - 7.25	7.25 - 8.00	6.50 - 7.60
June 4	7.50 - 8.40	7.75 - 8.35	8.50 - 8.75	6.75 - 7.75	6.50 - 7.75	7.25 - 8.00	6.50 - 7.60
" 11	7.65 - 8.75	7.75 - 8.35	7.50 - 8.75	6.75 - 7.75	6.75 - 7.75	6.50 - 7.75	6.50 - 7.75
" 18	8.00 - 9.00	8.00 - 9.00	7.50 - 9.20	6.50 - 7.65	6.25 - 6.80	6.50 - 7.25	6.50 - 7.75
" 25	7.90 - 9.00	8.00 - 9.00	7.60 - 9.00	6.50 - 7.50	6.25 - 6.70	6.75 - 7.75	6.50 - 7.75
July 2	8.00 - 9.00	8.00 - 9.00	7.60 - 9.00	6.50 - 7.40	6.50 - 7.00	6.50 - 7.50	6.50 - 7.75
" 9	7.85 - 9.00	8.00 - 9.00	7.60 - 9.00	6.25 - 7.25	6.25 - 6.90	6.50 - 7.50	6.50 - 7.75
" 16	7.85 - 9.25	8.25 - 9.25	7.80 - 9.15	6.45 - 7.40	6.25 - 6.90	6.50 - 7.50	6.50 - 7.75
" 23	7.75 - 9.25	8.25 - 9.00	7.90 - 9.10	6.50 - 7.25	6.25 - 6.80	6.50 - 7.50	7.00 - 7.50
" 30	7.60 - 9.00	8.25 - 9.00	8.75 - 9.10	6.25 - 7.00	6.00 - 6.60	6.50 - 7.50	6.75 - 7.25
Aug. 6	7.40 - 9.10	8.40 - 9.00	8.75 - 9.00	6.50 - 6.90	6.10 - 6.80	6.50 - 7.25	6.75 - 7.50
" 13	7.25 - 9.00	8.25 - 9.00	8.50 - 9.20	6.50 - 7.00	6.10 - 6.80	6.00 - 7.00	7.00 - 7.15
" 20	7.25 - 8.75	8.25 - 9.00	8.50 - 9.00	6.40 - 6.70	6.10 - 6.50	5.50 - 6.50	7.00 - 7.15
" 27	7.40 - 8.75	8.25 - 9.00	8.50 - 9.10	6.40 - 7.00	6.00 - 6.80	5.25 - 5.75	6.75 - 7.00
Sept. 3	7.85 - 9.20	8.25 - 9.00	8.50 - 9.10	6.40 - 7.00	6.00 - 6.80	5.25 - 5.75	6.75 - 7.00
" 10	7.70 - 8.90	8.25 - 9.00	8.50 - 9.10	6.50 - 7.00	6.00 - 6.90	5.60 - 6.25	6.60 - 7.00
" 17	7.60 - 8.90	8.25 - 8.60	8.50 - 9.25	6.50 - 7.00	6.25 - 6.80	5.00 - 6.10	6.25 - 6.75
" 24	7.90 - 9.00	8.25 - 8.75	8.50 - 9.40	6.75 - 7.25	6.25 - 7.00	5.00 - 5.75	6.25 - 6.75
Oct. 1	7.75 - 9.50	8.00 - 8.50	8.50 - 9.50	6.75 - 7.25	6.25 - 6.85	5.75 - 6.25	6.25 - 6.75
" 8	7.85 - 9.00	8.00 - 8.50	8.50 - 9.50	6.00 - 6.75	7.00 - 7.75	5.75 - 6.25	6.25 - 6.75
" 15	7.65 - 9.00	7.25 - 8.15	8.50 - 9.50	6.25 - 7.50	6.80 - 7.55	6.25 - 7.15	6.10 - 6.50
" 22	7.60 - 8.85	7.50 - 8.50	8.50 - 9.60	6.25 - 7.25	6.50 - 7.25	6.10 - 6.50	6.10 - 6.50
" 29	7.60 - 8.85	7.25 - 7.75	8.50 - 9.75	6.00 - 7.75	7.00 - 7.65	6.25 - 6.75	6.15 - 6.50
Nov. 5	7.75 - 9.10	7.25 - 8.25	8.50 - 9.65	6.25 - 7.75	6.75 - 7.75	6.10 - 6.50	6.35 - 6.85
" 12	8.25 - 8.90	7.35 - 8.25	8.25 - 9.80	6.50 - 7.75	6.50 - 7.50	5.75 - 6.25	6.35 - 6.75
" 19	7.60 - 8.85	7.35 - 8.00	8.10 - 9.55	6.50 - 7.75	6.70 - 7.50	5.75 - 6.25	6.10 - 6.50
" 26	7.60 - 8.75	7.50 - 8.25	8.10 - 9.25	7.50 - 8.25	7.00 - 7.75	5.75 - 6.35	6.25 - 6.85
Dec. 3	7.75 - 8.85	7.75 - 8.75	8.10 - 9.25	7.50 - 8.25	7.25 - 8.25	5.75 - 6.25	6.25 - 6.85
" 10	7.80 - 9.00	7.75 - 8.75	8.10 - 9.25	7.50 - 9.50	7.25 - 8.25	5.80 - 6.25	6.10 - 6.50
" 17	7.05 - 8.75	7.75 - 8.25	8.25 - 9.60	8.50 - 9.00	7.75 - 8.90	6.00 - 6.50	6.00 - 6.50
" 24	7.60 - 8.75	7.75 - 8.00	8.25 - 9.70	8.50 - 9.00	7.75 - 9.00	6.25 - 6.75	6.10 - 6.75
" 31	7.75 - 9.00	7.75 - 8.50	8.50 - 9.70	8.50 - 9.00	7.75 - 9.50	6.35 - 7.00	6.00 - 6.75
1914.							
Jan. 7	7.85 - 9.15	8.25 - 9.00	8.50 - 9.35	7.75 - 8.75	7.25 - 8.75	6.50 - 7.00	6.00 - 6.75
" 14	7.85 - 9.00	8.00 - 9.00	8.75 - 9.50	7.25 - 7.75	7.25 - 8.50	6.40 - 7.00	6.10 - 6.75
" 21	8.00 - 9.10	8.15 - 8.90	8.65 - 9.50	7.75 - 8.50	7.25 - 8.50	6.75 - 7.00	6.50 - 7.00
" 28	8.00 - 9.00	7.75 - 8.90	8.65 - 9.50	7.50 - 8.25	7.80 - 8.65	6.75 - 7.50	6.50 - 7.00
Feb. 4	8.00 - 9.00	8.00 - 9.10	8.65 - 9.50	7.50 - 8.25	7.50 - 8.50	6.75 - 7.50	6.50 - 7.00
" 11	8.00 - 9.25	8.25 - 9.25	... - 9.50	7.50 - 8.25	7.50 - 8.50	6.75 - 7.50	6.50 - 7.00
" 18	8.10 - 9.25	8.50 - 9.25	8.50 - 9.50	7.50 - 8.75	7.75 - 8.50	6.50 - 7.50	6.50 - 7.00
" 25	7.90 - 9.00	8.50 - 9.00	9.10 - 9.75	8.00 - 8.75	7.75 - 8.65	6.50 - 7.50	6.50 - 7.15
Mar. 4	8.00 - 9.00	8.25 - 8.90	8.75 - 9.75	7.25 - 8.50	7.40 - 8.00	6.50 - 7.50	6.75 - 7.35
" 11	8.15 - 9.50	8.25 - 9.25	8.75 - 9.70	7.00 - 8.25	7.30 - 8.30	6.25 - 7.75	7.00 - 7.35
" 18	8.10 - 9.35	8.15 - 9.00	8.75 - 9.50	8.00 - 8.40	7.45 - 8.45	6.75 - 7.75	7.00 - 7.40
" 25	8.15 - 9.30	8.25 - 9.25	8.00 - 9.70	8.10 - 8.75	7.75 - 8.35	6.50 - 7.75	7.00 - 7.25

SESSIONAL PAPER No. 15a

WHOLESALE QUOTATIONS FOR CASH WHEAT from April 7, 1913, to March 30, 1914.

(From "Free Press" (Winnipeg), and "Northwestern Miller.")

Week.	Minneapolis.	Chicago.	Winnipeg.	Liverpool.
	No. 1 Northern per bush.	No. 1 Northern per bush.	No. 1 Northern per bush.	No. 1 Northern (Manitoba) per bush.
1913.	Cts.	Cts.	Cts.	$ Cts.
April 7	88	92¾	89⅞	1.21¼
" 14	86⅞	93	89⅛	1.12⅜
" 21	90	93¾	90⅜	.....
" 28	90⅞	94½	93¼	.....
May 5	89½	92½	..	1.15½
" 12	90⅝	92	93¼	1.13½
" 19	91⅛	92¼	93¼	.....
" 26	92¾	94	95	.....
June 2	92	93¾	93¾	.....
" 9	91	93⅜	...	.....
" 16	94½	95	99½	1.13⅛
" 23	92	94¼	97¾	1.13¼
" 30	91¾	95	96½	.....
July 7	91⅝	93½	97⅝	1.13⅛
" 14	90⅝	92¼	97¾	1 13¼
" 21	90½	92	97	1.13¾
" 28	87⅞	92½	95½	1.13⅛
Aug. 4	88¾	...	96¼	.....
" 11	88¼	91½	...	1.13⅛
" 18	88¾	92	94½	1.12½
" 25	88⅜	...	94¼	1.13⅛
Sept. 1	...	92⅜	...	1.11⅝
" 8	89½	94	88½	1.12½
" 15	87¾	93	86⅝	1.11⅜
" 22	84¾	91	83⅞	1.11¾
" 29	85	..	83⅛	1.10¾
Oct. 6	83¾	..	81⅝	.....
" 13	84⅛	..	81	1.08¼
" 20	82½	88½	...	99⅜
" 27	84¾	89¼	81¼	99⅛
Nov. 3	84¼	89¼	81⅞	1.00⅜
" 10	84⅛	90¼	82⅝	..
" 17	84⅛	90¼	85	1.00⅝
" 24	84⅛	90	85	1.00⅜
Dec. 1	84⅜	90	83⅜	.....
" 8	86½	92	84¼	1.02¾
" 15	86⅜	92	83¼	1.03⅛
" 22	85¾	...	82¾	1.03½
" 29	85⅛	91¾	83⅜	1.02¼
1914.				
Jan. 5	87⅛	91	84½	.....
" 12	87¾	..	85¼	1.04⅝
" 19	87½	93	85	1.04⅜
" 26	88⅜	..	86¼	1.05¼
Feb. 2	89⅜	91⅞	86½	1 05¼
" 9	91½	...	87½	1.05⅝
" 16	92½	97	89½	.....
" 23	...	97	90⅜	1.10⅜
Mar. 2	93⅛	96½	91⅛	1.09½
" 9	92	96	89⅜	1.07⅜
" 16	92⅞	97	90¼	1.05⅝
" 25	93½	97	91	1.06½
" 30	91⅜	..	89¾	1.07⅜

WHOLESALE QUOTATIONS FOR MALTING BARLEY each week from April 5, 1913, to March 28, 1914.

(From "Weekly Northwestern Miller.")

Week.	Minneapolis.	Buffalo.	Milwaukee.	Toronto.	Winnipeg.
	"Best Malting" per bush.	"Best Malting" per bush.	"No. 2" per bush.	"No. 2" per bush.	"No. 3" per bush.
1913.	Cts.	Cts.	Cts.	Cts.	Cts.
April 5	56	57–64	69–70	55–60	48½
" 12	57	60–68	68–70	55–60	50
" 19	57	56–62	69–70	55–60	49½
" 26	58	59–66	69–70	55–60	49½
May 3	58	55–62	69–70	55–60	48½
" 10	59	55–56	69–70	55–60	46½
" 17	60	55–65	68–69	55–60	47
" 24	60	58–70	68–70	55–60	47½
" 31	60	55–60	68–70	55–60	47½
June 7	58	57–62	68–70	55–60	46½
" 14	59	58–65	68–70	55–60	47½
" 21	58	57–60	66–68	55–60	48½
" 28	59	58–65	66–67	55–60	47½
July 5	.....	.....	.....	55–60	48½
" 12	56	55–57	62–63	55–60	49
" 19	54½	59–60	62–63	55–60	47
" 26	56	55–57	63–64	55–60	46½
Aug. 2	57	56–58	63–64	55–60	45
" 9	61	60–65	65–66	55–60	45½
" 16	66	68–70	71–72	50–55	45½
" 23	70	76–80	75–76	50–55	46
" 30	69	70–75	74–75	50–55	45½
Sept. 6	73	72–78	76–80	50–55	48
" 13	70	70–72	80–81	50–55	48½
" 20	71	72–80	80–82	52–57	47
" 27	70	72–80	81–82	52–57	45
Oct. 4	70	70–71	81–82	52–57	45½
" 11	68	67–75	81–82	52–57	45
" 18	67	70–72	81	52–57	41½
" 25	66	69–78	80–81	56–58	41½
Nov. 1	67	68–80	81–82	58–61	43
" 8	66	66–78	80	58–61	43½
" 15	65	67–80	80–81	58–61	43
" 22	64	65–80	80–81	58–61	43½
" 29	68	72–78	79–80	60–63	42½
Dec. 6	69	65–75	78–79	60–63	42½
" 13	67	66–80	77–78	55–60	42
" 20	67	67–80	76–78	55–60	41½
" 27	66	67–80	76–78	55–60	41
1914.					
Jan. 3	66	68–80	76–77	55–60	41½
" 10	67	68–80	77–78	55–57	41½
" 17	66	67–80	77–7	55–57	41½
" 24	64	67–76	75–77	55–57	41½
" 31	65	65–75	75–77	55–57	41½
Feb. 7	64	63–70	75–76	55–57	41½
" 14	64	60–75	72–73	55–57	42½
" 21	64	69–75	72–73	55–57	44½
" 28	63	65–78	72–73	55–57	45½
Mar. 7	62	63–72	65–69	55–57	45½
" 14	58	63½	66–68	55–57	45½
" 21	57	.....	66–68	55–57	45½
" 28	56	65–75	65–68	55–60	45½

SESSIONAL PAPER No. 15a

WHOLESALE QUOTATIONS FOR SPRING WHEAT FLOUR, Second Patent, in sacks, in first week of each month from April, 1913, to March, 1914.

(From "Weekly Northwestern Miller.")

Month.	New York.	Chicago.	Montreal.	Toronto.	Winnipeg.	London.	Liverpool.
	F.O.B. New York.	F.O.B. Chicago.	Delivered to Retailers.	F.O.B. Toronto.	Delivered.	C.I.F. Quotation by Mills.	C.I.F. Quotation by Mills.
	Per 196 lb.	Per 196 lb.	Per 196 lb.	Per 196 lb.	Per 196 lb.	Per 196 lb.	Per 196 lb.
1913.	$	$	$	$	$	$	$
April.	4.25 - 4.45	4.15 - 4.25	5.20	4.80	4.90	4.20	4.17
May.	4.35 - 4.60	4.30 - 4.50	5.20	4.80	4.90	4.37	4.33
June.....	4.35 - 4.65	4.35 - 4.60	5.20	4.80	4.90	4.37	4.42
July	4.40 - 4.65	4.30 - 4.50	5.40	5.00	5.10	4.37	4.37
August.....	4.40 - 4.60	4.35 - 4.50	5.40	5.00	5.10	4.42	4.38
September ..	4.40 - 4.60	4.30 - 4.40	5.40	5.00	5.10	4.29	4.29
October.	4.25 - 4.50	4.00 - 4.30	5.20	4.80	4.90	4.12	4.12
November...	4.05 - 4.25	4.00 - 4.20	5.20	4.80	4.80	3.96	3.96
December. ..	4.10 - 4.25	4.00 - 4.25	5.20	4.80	4.80	3.99	3.99
1914.							
January.....	4.10 - 4.30	4.00 - 4.30	5.20	4.80	4.70	4.09	4.12
February....	4.20 - 4.45	4.15 - 4.35	4.90	4.80	4.70	4.08	4.12
March.	4.25 - 4.45	4.30 - 4.45	5.10	5.00	4.70	4.24	4.20

WHOLESALE QUOTATIONS PER BARREL for eight varieties of No. 1 Apples each fortnight from September 10, 1913, to March 25, 1914.

GRAVENSTEIN.

Date.	Halifax.	Montreal.	Toronto.	Winnipeg.	Boston.	New-York.	Chicago.	London. (Canadian).	Liverpool (Canadian).	Glasgow (Canadian).
1913.	$	$	$	$	$	$	$	$	$	$
Sept. 10	3 50				3 00 - 4 00	2 00 - 3 00				
" 24	3 50	4 50	4 00	4 65	3 00 - 4 50	2 50 - 3 75			5 22 - 5 83	4 38 - 5 10
Oct. 8	3 50	4 50	4 00		3 00 - 4 00			4 62 - 5 10		4 86
" 22	4 00	4 25	4 25	4 85	3 00 - 4 00	2 50 - 3 75				
Nov. 5		4 75	4 50							

FAMEUSE.

Sept. 10		5 00								
" 24		5 50	4 50							
Oct. 8	2 00	6 00	4 50	7 50	3 00 - 3 50	2 25 - 4 00			6 80	7 53
" 22	3 00	6 25	4 75		3 00 - 3 50	2 25 - 4 00			4 68 - 6 56	5 95
Nov. 5	3 50	6 50	5 00	7 50	3 00 - 4 00	2 50 - 4 50	4 00 - 4 50			
" 19	3 50	6 75	5 50		3 00 - 4 00		4 00 - 4 50			
Dec. 3	3 50	7 00			3 00 - 4 00	2 50 - 4 75	4 00 - 4 50			
" 17	3 50	7 25			3 00 - 4 00					
" 31		7 25		5 00	3 00 - 4 00					

GREENING.

Sept. 10						2 00 - 3 00				
" 24		4 00 -		4 25	2 50 - 3 00	2 00 - 3 00				4 86 - 5 10
Oct. 8	3 50 -	4 00 -	3 25		2 50 - 3 00	2 25 - 3 25	2 50 - 3 00		4 56	- 5 10
" 22	3 50 -	4 00 -	3 50 -	4 25 -	2 50 - 3 00	2 50 - 3 00	2 50 - 3 00	4 62 - 5 10	4 62 - 5 59	4 62 - 4 86
Nov. 5	3 50 -	4 25 -	3 50 -		2 50 - 3 00	3 50 - 4 50	3 25 - 3 50		3 65 - 4 50	- 5 59
" 19	3 50 -	4 25 -	3 50 -	4 50 -	2 50 - 3 00	3 50 - 4 50	3 75 - 4 00		- 5 59	- 6 07
Dec. 3		4 75 -	3 50 -		2 50 - 3 00	3 50 - 4 75	4 00 - 4 25		4 86 - 5 83	5 83 - 6 07
" 17		4 75 -	3 50 -		2 50 - 3 00	3 50 - 4 50	4 00 - 4 25	- 4 86	- 4 80	4 86 - 5 34
" 31		4 75 -	3 50 -		2 50 - 3 00	3 50 - 5 50	4 00 - 4 25	- 5 34		- 3 89
1914.										
Jan. 14		5 00	3 25 -		2 50 - 3 00	3 50 - 4 75	4 50			- 6 07
" 28		5 00 -	3 50 -		3 50 - 4 00	3 50 - 5 00	5 00 - 5 50			- 5 85
Feb. 11		5 00 -			3 50 - 4 00	3 50 - 4 75	5 00 - 5 25			

" 25		5 25 –			3 50 – 4 00	4 00 – 6 00	5 00 – 5 25	6 07 – 6 32			
Mar. 11		5 50 –			3 50 – 4 50	5 00 – 6 00	5 00 – 5 25				
" 25		5 50 –			3 50 – 4 50	4 00 – 6 00	5 50 – 6 00				

KING.

Sept. 10											
" 24		4 50 –									
Oct. 8	4 50 –	4 50 –	4 00 –		3 00 – 3 50	2 50 – 3 50	3 00 – 3 50				7 05 – 8 51
" 22	4 50 –	4 50 –	4 25 –	4 50 –	3 00 – 3 50	2 50 – 3 50	2 75 – 3 50			6 07 – 7 53	6 07 – 7 17
Nov. 5	4 50 –	5 00 –	4 50 –		3 50 – 4 00	2 50 – 3 75	3 50 – 4 00			4 98 – 6 19	6 44 – 7 43
" 19	4 50 –	5 00 –	4 75 –	5 50 –	3 00 – 3 50	3 50 – 5 00	3 50 – 4 25	4 38 – 5 83			6 56 – 8 51
Dec. 3	5 00 –	5 25	4 75 –		3 00 – 3 50	3 50 – 5 00	3 50 – 4 25	5 10 – 6 07		3 40 – 4 38	– 7 29
" 17	5 00 –	5 25 –	4 75 –	5 50 –	3 00 – 3 50	3 50 – 5 00	3 75 – 4 25			3 95 – 4 86	
" 31		5 50 –	4 50 –		3 00 – 3 50	3 50 – 5 00	3 75 – 4 25				
1914.											
Jan. 14		5 50 –		6 50 –	3 00 – 3 50	3 50 – 5 00	5 00 – 5 50				
" 28		5 75 –			3 00 – 4 50	4 00 – 5 25	5 50 – 5 75				
Feb. 11		5 75 –			3 00 – 4 50	4 00 – 5 00	5 50 – 5 75				
" 25		6 00 –			3 00 – 4 50	4 00 – 5 50	5 50 – 5 75				
Mar. 11		6 00 –			4 00 – 5 00	5 00 – 6 25	5 50 – 5 75				
" 25		6 00 –			4 00 – 5 00	4 00 – 5 50	5 50 – 5 75				

BALDWIN.

1913.											
Sept. 10											
" 24											
Oct. 8		4 00 –		4 50 –		2 00 – 3 00					
" 22		4 00 –	3 25 –			2 00 – 3 25					
Nov. 5		4 25 –	3 50 –	5 25 –	2 75 – 3 00	2 00 – 3 00	3 00 – 3 25				4 50 – 5 22
" 19		4 25 –	3 50 –		2 75 – 3 00	2 00 – 3 50	3 25 – 3 50			4 25 – 5 34	5 59 – 5 95
Dec. 3	4 00 –	4 50 –	3 75 –	5 25 –	2 75 – 3 75	4 00 – 4 50	3 25 – 4 00	5 10 – 5 34		5 34 – 6 32	6 07 – 6 68
" 17	4 00 –	4 50 –	3 75 –		2 75 – 3 75	3 50 – 4 75	2 50 – 4 00	5 83 – 6 07		5 83 – 6 07	6 07 – 6 32
" 31	4 00 –	4 75 –	3 50 –		2 75 – 3 75	3 75 – 4 75	4 00 – 4 25	5 34 – 6 07		5 95 – 6 44	5 34 – 6 32
1914.					3 50 – 4 00	4 00 – 5 00	4 00 – 4 25	– 5 59			5 46 – 6 92
Jan. 14	4 00 –	4 75 –	3 50 –		3 50 – 4 00	3 75 – 5 25	4 25 – 4 50	– 5 10		6 44 – 6 60	4 86 – 6 07
" 28	4 00 –	4 75 –	3 75 –		4 00 – 4 25	3 75 – 5 25	5 00 – 5 50	4 38 – 5 83		6 07 – 6 32	5 34 – 6 32
Feb. 11	4 00 –	4 75 –	4 00 –		4 00 – 4 25	3 75 – 5 25	5 00 – 5 50	4 62 – 5 83		6 32 – 6 56	6 07 – 7 29
" 25	4 00 –	5 00 –	4 25 –	6 25 –	4 00 – 4 25	4 00 – 5 50	5 50 – 5 75	5 59 – 5 83		6 68 – 7 65	6 89 – 7 05
Mar. 11		5 25 –	4 50 –		4 00 – 5 00	5 00 – 6 25	5 50 – 6 00				7 29
" 25		5 25 –	5 50 –	6 25 –	4 00 – 5 00	4 00 – 5 50	5 50 – 5 75			– 7 05	7 29 – 8 51

WHOLESALE QUOTATIONS PER BARREL for eight varieties of No. 1 Apples, &c.—*Continued.*

SPY.

Date.	Halifax.	Montreal.	Toronto.	Winnipeg.	Boston.	New York.	Chicago.	London. (Canadian.)	Liverpool. (Canadian.)	Glasgow. (Canadian.)
1913.	$	$	$	$	$	$	$	$	$	$
Sept. 10										
" 24										
Oct. 8		4 50 - ..								
" 22		4 75 - ..		5 00 - ..						
Nov. 5		5 00 - ..	4 00 - ..				3 50 - 4 00			5 59 - 5 83
" 19		5 00 - ..	4 00 - ..			3 50 - 5 00	3 50 - 4 00	.. - 5 83	5 59 - 6 32	6 56 - 7 17
Dec. 3	4 00 - ..	5 25 - ..	4 50 - ..	5 50 - ..		3 50 - 5 00	3 75 - 4 25	5 83 - 6 07	5 59 - 5 95	6 07 - 6 32
" 17	4 00 - ..	5 25 - ..	4 75 - ..			3 50 - 5 00	3 75 - 4 25	4 38 - 6 07	5 71 - 6 07	4 38 - 4 86
" 31	4 00 - ..	5 50 - ..	5 00 - ..	5 50 - ..		3 50 - 5 00	3 75 - 4 25			.. - 5 10
1914.										
Jan. 14	4 50 - ..	5 50 - ..	5 25 - ..			3 50 - 4 50	4 00 - 4 50	.. - 5 34		
" 28	4 50 - ..	5 75 - ..	5 25 - ..	4 75 - ..	3 50 - 5 00	3 50 - 5 50	4 50 - 5 00		.. - 5 59	
Feb. 11	5 00 - ..	6 00 - ..	5 50 - ..		3 50 - 5 00	3 50 - 5 50	5 50 - 6 00	.. - 6 44		5 83 - 6 32
" 25	5 50 - ..	6 25 - ..	5 75 - ..	6 50 - ..	3 50 - 5 00	4 00 - 6 00	5 50 - 6 00			
Mar. 11	6 00 - ..	6 50 - ..	6 00 - ..		3 50 - 5 00	5 00 - 6 25	5 50 - 6 00	.. - 7 78		6 80 - 7 29
" 25	6 00 - ..	6 75 - ..	7 00 - ..	7 50 - ..	3 50 - 5 00	4 00 - 6 00				8 02 - 8 51

BEN DAVIS.

Date.	Halifax.	Montreal.	Toronto.	Winnipeg.	Boston.	New York.	Chicago.	London. (Canadian.)	Liverpool. (Canadian.)	Glasgow. (Canadian.)
1913.										
Sept. 10										
" 24										
Oct. 8		3 75 - ..				2 00 - 3 00	2 00 - 2 25			
" 22		3 75 - ..				2 00 - 3 00	2 00 - 2 25			
Nov. 5		4 00 - ..	3 00 - ..			2 00 - 3 00	2 50 - 3 00	.. - 4 13	.. - 3 65	.. - 4 13
" 19		4 00 - ..	3 00 - ..			2 25 - 3 25	3 00 - 3 50	3 89 - 4 13	4 62 - 4 86	4 38 - 4 74
Dec. 3	4 00 - ..	4 25 - ..	3 00 - ..			2 25 - 3 25	3 00 - 3 50	4 13 - 4 86	4 86 - 5 10	4 38 - 4 86
" 17	4 00 - ..	4 25 - ..	3 00 - ..			2 50 - 3 75	3 00 - 3 50	3 89 - 4 13	5 34 - 5 59	4 38 - 4 62
" 31	4 00 - ..	4 25 - ..	3 00 - ..			4 00 - 5 00	3 00 - 3 50	4 38 - 4 86		4 86 - 5 83
1914.										
Jan. 14	4 00 - ..	4 75 - ..	3 00 - ..	5 75 - ..			3 50 - 4 00	.. - 4 13	5 10 - 5 46	5 10 - 5 83
" 28	4 00 - ..	4 75 - ..	3 25 - ..		3 00 - 3 50		3 75 - 4 25	4 38 - 4 62	5 22 - 5 44	4 62 - 5 34
Feb. 11	4 00 - ..	5 00 - ..	3 50 - ..		3 00 - 3 50		3 75 - 4 25	4 38 - 4 86	5 22 - 5 59	5 59 - 6 07

" 25	4 00 – ..	5 00 – ..	3 75 – ..	.....	3 00 – 3 50	.....	4 75 –	4 62 – 5 83	5 83 – 6 32	6 07 – 6 32
Mar. 11	.....	5 00 – ..	4 25 – ..	.....	3 00 – 3 75	4 50 – 5 25	4 75 –	.... – 5 59	... – 7 17	6 32 – 6 80
" 25	.....	5 25 – ..	5 00 – ..	.....	3 00 – 3 75	.....	4 00 – 4 75	6 07 – 6 56	.... – 6 80	6 44 – 6 92

GOLDEN RUSSET.

1913.										
Sept. 10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
" 24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oct. 8	.....	4 00 – ..	.....	.....	.....	.....	.....	.....	.....	.....
" 22	.....	4 25 – ..	.....	4 50 – ..	.....	.....	.....	.....	.....	.....
Nov. 5	.....	4 75 – ..	3 25 – ..	.....	.....	.....	.....	.....	.... – 5 34	.... – 5 59
" 19	.....	4 75 – ..	3 25 – ..	5 00 – ..	.....	.....	.....	.... – 6 07	5 59 – 6 19	.... – 6 07
Dec. 3	.....	5 00 – ..	3 50 – ..	.....	.....	.....	.....	6 07 – 6 56	... – 6 92	5 10 – 5 34
" 17	.....	5 00 – ..	3 50 – ..	5 00 – ..	.....	.....	.....	6 56 – 7 53	5 34 – 5 83	4 38 – 5 10
" 31	.....	5 00 – ..	3 50 – ..	.....	.....	.....	.....	5 34 – 6 56	.....	.... – 4 19
1914.										
Jan. 14	.....	5 25 – ..	3 75 – ..	.....	.....	.....	.....	.... – 7 05	.....	6 80 – 7 29
" 28	5 00 – ..	5 25 – ..	4 00 – ..	6 00 – ..	3 00 – 4 00	.....	.....	6 56 – 7 53	.....	7 23 – 7 53
Feb. 11	5 00 – ..	5 25 – ..	4 50 – ..	.....	3 00 – 4 00	3 25 – 3 50	.....	6 32 – 7 05	.....	6 80 – 6 92
" 25	5 00 – ..	5 50 – ..	5 00 – ..	.....	3 00 – 4 00	3 50 – 4 00	.....	7 05 – 7 29	6 32 – 6 80	6 68 – 7 65
Mar. 11	5 00 – ..	5 50 – ..	5 50 – ..	.....	3 00 – 4 00	.....	.....	.... – 7 29	.....	.... – 8 75
" 25	5 00 – ..	5 75 – ..	5 50 – ..	.....	3 00 – 4 00	.....	.....	.....	.... – 8 51	.... – 8 51

APPENDIX III.

REPORT OF THE FRUIT DIVISION.

THE STAFF.

The arrangement made at the beginning of the season 1912-13, whereby the country was divided, for inspection purposes, into five districts with a chief inspector in charge of each, was continued during this season as it had proved most satisfactory during the previous year. The staff of 51 inspectors (16 permanent and 35 temporary) was distributed as follows:

District No. 1, Maritime Provinces.—G. H. Vroom, Chief Inspector.

Halifax.—A. S. Alcorn, W. C. Healy, Stuart Dimock, George Akins, W. E. Anderson, A. T. Morse.
Annapolis Valley, N.S.—W. Bishop, F. B. Westcott.
Cape Breton, N.S.—J. W. Chisholm.
Lunenburg and Queens, N.S.—Howard Osborne.
Prince Edward Island.—C. M. Williams.
New Brunswick.—S. L. Peters.

District No. 2, Quebec and Eastern Ontario.—W. W. Brown, Chief Inspector.

Quebec City.—E. Bedard.
* Montreal.—F. L. Deary, E. H. Wartman, J. A. Jones, F. T Curley
Lake Ontario Counties.—W. McCullough, Wallace McQuoid, William Armour.
Ottawa Valley.—C. H. Snow.

District No. 3, Western Ontario.—R. R. Waddle, Chief Inspector.

Toronto.—W. G. Smith.
Hamilton to St. Catharines.—F. L. Gabel.
St. Catharines to Niagara.—Byron Honsberger.
Lake Erie Counties.—George Connor.
Inland Counties.—J. J. Pritchard, Moses Unger.
Lake Huron Counties.—A. E. Durnin.
Georgian Bay.—G. B. Carnahan.
Sault Ste. Marie.—George Honsberger.
Lake Superior.—† Evor Leonard.

District 4, Prairie Provinces.—C. W. Baxter, Chief Inspector.

Winnipeg.—Joseph Carman, Corbin Weld.
Brandon.—J. H. Fleming.
Regina.—J. W. Clement.
Saskatoon.—R. J. Wallace.

* At the close of navigation, the Montreal staff is moved to Lake Ontario points.
† Transferred to Lake Ontario district after close of navigation.

Medicine Hat.—Frank Metcalf.
Calgary.—M. P. McNeill.
Lethbridge.—J. H. McCauley.
Edmonton.—F. H. Steele.

District 5, British Columbia.—R. G. L. Clarke, Chief Inspector.

Vancouver.—A. H. Flack.
Vancouver Island—Henry Callow.
Interior.—A. McL. Fletcher.

Customs Officers acting as Dominion Fruit Inspectors.—

Nelson, B.C.—J. G. Bunyan.
Grand Forks, B.C.—W. J. Cook.
Prince Rupert, B. C.—J. H. McLeod.

In addition to his duties as packing expert and orchard demonstrator, Mr. P. J. Carey, owing to the illness of Col. W. W. Brown, acted as chief inspector in the Montreal and Lake Ontario District during the greater part of the season.

I regret to have to record the death of George Akins, temporary fruit inspector, at Falmouth, N.S., on March 4.

Mr. A. H. Flack, who was temporarily employed at Edmonton last season, was appointed, April 13, 1913, to the permanent staff to fill the inspectorship at Vancouver, B.C., left vacant by the resignation of Mr. D. M. Robertson.

Inspection Statistics.

The following table gives comparative statements of the number of lots inspected, and the number of packages inspected for the seasons 1908-9, 1909-10, 1910-11, 1911-12, 1912-13 and 1913-14.

Variety.	No. of Lots Inspected.	No. of pkgs. in Lots Inspected	No. of pkgs. Inspected.
1908-09.			
Apples ..... Brls.	5,940	682,657	42,223
" ..... Boxes.	248	100,792	2,701
Pears ..... "	88	54,150	7,924
Peaches ..... "	91	140,976	16,005
Plums ..... Baskets.	54	16,505	1,474
Tomatoes ..... "	53	11,381	779
Small fruits ..... Quarts.	863	1,184,651	154,874
1909-10.			
Apples ..... Brls.	7,736	859,572	63,232
" ..... Boxes.	902	157,939	7,363
Pears ..... "	248	41,459	2,738
Peaches ..... "	410	60,248	3,817
Plums ..... Baskets.	264	62,883	4,257
Tomatoes ..... "	149	50,043	3,241
Apricots ..... Boxes.	11	12,495	481
Small fruits ..... Quarts.	2,491	2,310,264	249,751
1910-11.			
Apples ..... Brls.	4,527	360,768	26,890
" ..... Boxes.	1,347	234,182	9,829
" ..... Baskets.	171	17,551	10,393
Pears ..... Boxes.	371	40,681	2,750
Peaches ..... "	11	2,269	36
" ..... Baskets.	383	70,564	5,932
Tomatoes ..... "	56	6,570	601
Plums ..... "	189	50,575	5,144
Small fruits ..... Quarts.	1,502	568,510	155,048
1911-12.			
Apples ..... Brls.	13,548	1,085,300	67,706
" ..... Boxes.	1,235	162,249	10,178
Pears ..... "	389	32,252	2,655
Peaches ..... "	38	3,487	268
" ..... Baskets.	365	34,606	2,864
Plums ..... "	336	88,894	7,554
Tomatoes ..... "	66	48,530	2,012
Small fruits ..... Quarts.	2,120	2,729,143	298,591
1912-13.			
Apples ..... Brls.	18,457	1,321,440	80,102
" ..... Boxes.*	2,101	204,971	133,578
" ..... Baskets.	119	16,249	2,719
Crab apples ..... Boxes.	62	12,186	695
" ..... Baskets.	17	1,395	660
Pears ..... Boxes.	272	36,356	2,202
Peaches ..... "	65	25,592	1,557
" ..... Baskets.	121	18,837	2,139
Plums ..... "	186	67,751	7,254
Tomatoes ..... "	264	39,174	6,940
Small fruits ..... Quarts.	1,187	2,264,559	172,945
1913-14.			
Apples ..... Brls.	11,725	799,510	59,643
" ..... Boxes.	2,631	341,679	29,879
" ..... Baskets.	105	11,908	1,219
Crab apples ..... Boxes.	192	13,240	1,462
Pears ..... "	977	48,274	8,559
Peaches ..... "	806	35,494	12,657
" ..... Baskets.	353	60,771	7,564
Plums ..... "	679	132,159	15,200
Tomatoes ..... "	173	59,707	7,305
Small fruits ..... Quarts.	736	1,128,907	95,841

* Corrected since last Annual Report, with addition of inspections in British Columbia.

PROSECUTIONS.

Following is a list of those who have been convicted, during the season 1913-14, of violation of the Inspection and Sale Act, Part IX:—

Nova Scotia—

F. C. Bill, Billtown.
J. D. Chambers, Newport.
W. H. Chase, Wolfville.
T. Chipman, Tupperville.
E. W. Cogswell, Berwick.
H. W. Forsythe, Greenwich.
Grand Pre Fruit Co., Grand Pre.
J. H. Harrington, Kentville.
G. H. Illsley, Port Williams.
G. E. Lamont, Billtown.
J. S. Lamont, Billtown.
I. Lingley, Cornwallis.
T. G. Magee, Billtown.
Wm. Maitland, Grand Pre.
J. A. McDonald, Steam Mills.
J. E. McGee, Port Williams.
J. N. McGowan, Hillaton.
J. T. Newcomb, Upper Dyke.
New Minas Fruit Co., New Minas.
Paradise Fruit Co., Paradise.
W. O. Parker, Avonport.
Rooney Bros., Windsor.
J. D. Sanford, Burlington.
Wm. Sharp, Windsor.
Sheffield Mills Fruit Co., Ltd. Sheffield Mills.
W. W. Smith, Windsor.
A. Spurr, Perott.
J. Timmins, Waterville.
Waterville Fruit Co., Waterville.
B. Woodworth, Church street.

Ontario—

W. J. Abernathy, Beeton.
A. Auld, Watford.
Carman Baker, Brighton.
W. J. Bragg, Mgr., Bowmanville F. G. A., Bowmanville.
Lorne H. Carey, Hamilton.
C. M. Carruthers, Bowmanville.
Clark & Collivar, Picton.
H. B. Cockburn, Delhi.
R. H. Collacott, Bowmanville.
John Coyle, Colborne.
John Coyle & Co., Bowmanville.
R. O. Crook, Beamsville.
Wm. Dickie, Burford.
H. I. Donaldson, Woodstock.

Ontario.—Con.

Manly Duetta, South Bay.
D. Ferguson, Picton.
Harvey Fisk, Gastleton.
Thomas Fitzgerald, Trenton.
Flavelles, Ltd., Oshawa.
Lincoln Fleming, Owen Sound.
Oliver Fortran, Burnley.
William Fox, Guelph.
N. S. Gaffield, Colborne.
Harry Groff, Trenton.
Geo. A. Gummer, Colborne.
Hugh Hanna, Carrying Place.
Burton Head, Milford.
Wm. Heideman, Shakespeare.
C. B. Higgins, Trenton.
J. P. Hughes, Picton.
Lewis Jones, St. Thomas.
John Joynt, Lucknow.
Kelly Bros., Colborne.
G. M. Knox, Cherry Valley.
R. S. Lang, Toronto.
R. S. Lang, Toronto.
Morley Lemon, Owen Sound.
A. Mallinson Co., Ltd., Norval.
S. R. Maneer, Port Dover.
D. C. Matthews, Colborne.
A. R. McKenzie, Colborne.
Milton, F. G. A., Milton.
Wm. Mullin, Glen William.
Neville & Bond, Mount Brydges.
Neville & Bond, Mount Brydges.
Orono F. G. A., Orono.
C. Ostrander, South Bay.
H. C. Pedwell, Thornbury.
W. H. Phillipps, Belleville.
W. H. Phillipps, Belleville.
W. H. Polley, Trenton.
Wm. Quick, Bowmanville.
B. R. Robinson, Fish Lake.
W. J. Roy, Tyrone.
G. Saylor, Trenton.
N. E. Sinclair, Freeman.
A. J. Stephenson, Glen Oak.
Charles D. Taft, Trenton.
T. B. Taylor, Grimsby.
Fred Terry, Bowmanville.
John Vancleaf, Picton.

Ontario—Con.

W. & F. Vandusen, Black River Bridge.
Geo. X. Walker, St. Catharines.
W. Walker, Burlington.
J. Whimpster & Co., Aurora.
Samuel Whittaker, Grimsby.
E. F. Warner, Stony Creek.
John Wilson, Ingersoll.
A. E. Wood, Stockdale.

British Columbia—

A. H. & J. Stevens, West Summerland.

Imported Fruit—

N. M. Johnson, Winnipeg, Man.
Scott Fruit Co., Lethbridge, Alta.
Scott Fruit Co., Medicine Hat, Alta.
Plunkett & Savage, Lethbridge, Alta.
Chess Bros., Vancouver, B.C.

On February 10, 1914, five boxes of pears, imported by George Vipond & Co., Winnipeg, Man., and not marked as required by the Act, were confiscated under section 320A (3) thereof.

THE FRUIT CROP REPORT.

During May, June, July, August and September, the Fruit Crop Report was regularly published on the 15th of the month. It was compiled from the reports of over 2,000 correspondents, and gave an accurate résumé of the crop prospects in the several provinces and in foreign countries, as well as general information regarding insects, fungous diseases, markets and other items of importance to the grower and to the merchant. A general outline of the fruit crop of 1913 follows:

THE SEASON OF 1913.

The winter of 1912-13 was a particularly favourable one to small fruits and to tree fruits. Growth continued perhaps too late in the fall of 1912, but as the trees were favoured with mild weather during the months of December, January, and even February, nothing serious resulted from that cause. Following a very mild spring, the weather became quite cold during May and the early part of June, heavy frosts being experienced throughout eastern Canada on June 7 and 8. Such conditions, coupled with a shortage of rainfall, resulted in quite a serious falling off in most varieties of fruit.

In apple production the season was below average. Early in the year, reports based upon the bloom were very favourable, but as the season advanced they became less optimistic. The development of apple scab in many sections, the remarkable severity of late spring frosts, the serious invasion of tent caterpillars, and other causes, all contributed to bring about a result which was not anticipated until the season was quite far advanced.

In Nova Scotia the crop of Gravensteins was decidedly short; in fact the only varieties which gave even a moderate yield were Blenheim, Ribston and Fallawater. Apple scab was extremely prevalent, and it was only where spraying was carried on thoroughly and persistently that the growers were able to hold it in check. For this reason there was of necessity a large quantity of inferior apples produced (a condition corresponding to that of 1912), and it was due to the co-operative methods of the United Fruit Companies that these apples were marketed in such large quantities and with so little waste.

In New Brunswick and Quebec the crop was a decidedly light one, greatly lowered in quality and yield by the ravages of the tent caterpillar early in the season. Many orchards were completely defoliated and it was no rare sight to see others which did not bear a dozen barrels of marketable apples. So far as reports go, the parasites which attack this insect were not present in sufficiently large numbers to greatly lessen the quantity of eggs laid in the late summer of 1913, but in a few isolated sections near Ottawa, a disease (probably bacterial), known as the 'Wilt Disease,' greatly

reduced the caterpillar. In these sections it is not expected that the pest will be as destructive in 1914, but in other localities the growers will have to rely upon arsenical sprays for protection, and a concerted effort in any seriously infected locality will keep the pest under control.

There was considerable variation in the quantity of fruit harvested in different parts of Ontario, but if the province be taken as a whole it would average between 45 and 50 per cent of a full crop. In the southern and western counties of Norfolk and Lambton, which are the main producing counties in that section, the crop was even smaller. Farther inland in Oxford county and in the counties of Middlesex, Huron and Bruce, the orchards seemed to suffer particularly from dry weather, and the fruit was of small size. Fortunately these counties are well covered by co-operative associations, with the result that much of the fruit was of good quality, and some orchards, particularly in Huron county, which were comparatively free from the effects of spring frosts and which had received careful attention, bore a fair crop of fruit.

In the counties of Northumberland, Durham, Prince Edward and Ontario, where the bulk of the apple crop is produced, there was about half a crop. Early in the season indications were extremely favourable. Bloom was abundant, and spraying was so general that little damage was expected from tent caterpillar. Spys and Baldwins were the only two varieties that were not expected to yield heavily. As the dry weather continued the prospects fell off, until at the end of the season all reports indicated barely fifty per cent of a crop, with Spys and Baldwins quite as abundant as any of the fall and winter varieties. Much of the fruit was small in size, a condition which existed generally throughout the province.

In eastern Ontario the crop suffered from much the same causes as in Quebec: early frosts, unfavourable weather at blossoming time, apple scab and tent caterpillar. At no time during the entire season were reports, other than of the most pessimistic nature, received. This district, in the ordinary year, produces a large quantity of Fameuse and McIntosh apples. In 1913 the crop was light and much damaged by apple scab, and the season was, generally speaking, one of the most unsatisfactory which eastern Ontario and Quebec had experienced for many years.

In British Columbia the season opened somewhat later than usual, but some of the early apples were injured by frost early in May. On the lower mainland cold weather set in about blossoming time, and many of the blooms did not set fruit. In the inland valleys, climatic conditions were more favourable, though the wet weather caused a prevalence of scab, particularly in the Kootenay valley, where much of the fruit was practically ruined. This was the first season in which apple scab had been by any means serious in British Columbia, and will undoubtedly impress upon the growers the necessity for thorough spraying.

Reviewing the apple situation for 1913, it is evident that the season was universally one of the poorest experienced for many years. In no section was the yield an average one, and in many localities it was practically an utter failure. In Nova Scotia scab caused much damage to early varieties, particularly Gravensteins, with the result that practically none of these reached the prairie markets, and consequently large quantities were imported from the States further south to meet the demand. In eastern Ontario and Quebec the main source of trouble lay in the infestation of tent caterpillars, which reduced the crop to a very low ebb. Serious frosts in June and continued dry weather also intervened, and these were quite a dangerous factor in western Ontario. In British Columbia, an early frost, wet weather at blossoming time, a heavy drop in June, and the presence of apple scab, all contributed in causing a lighter crop than in 1912, and one which was not of the highest quality.

The peach crop was a very satisfactory one, both in British Columbia and the Niagara district. There was very little damage by frost except in some small isolated orchards which were situated outside the recognized peach zone. In the counties of

Lambton, Kent and Essex, where considerable planting is being done, the yield was good. Several new orchards bore quite heavily and materially affected the market. Heavy shipments were made from Ontario to the prairie markets with very successful result. Reference is made elsewhere to the damage which was done to baskets in some of these shipments. British Columbia peaches were marketed quite largely in Alberta and Saskatchewan, and met with satisfactory prices. These markets are supplied to a great extent by American peaches, which mature earlier than those grown in British Columbia, and of course lessen somewhat the demand for the latter. In Ontario the plum crop was probably the largest harvested for many years. Several of the larger markets were over supplied; prices were consequently low, and much of the fruit was literally given away at points of production. In British Columbia there was also a heavy crop, particularly of the later varieties. In both these provinces, the early reports were quite unfavourable, as it was thought that the early spring frosts would greatly lessen the crop, but as the season advanced the reports were that, although many blooms had been destroyed by frost, much less damage was done than expected. In Nova Scotia the crop was a light one.

During the early part of 1913 it appeared as if pears would follow much the same course as apples, and that the crop would be small. In the commercial orchards of Ontario, however, the crop generally was excellent, Bartletts being particularly abundant. Practically all the commercial orchards gave satisfactory yields, in spite of the somewhat heavy 'June drop.' In Nova Scotia reports were never favourable, and many growers had almost a total failure. In British Columbia, too, pears were generally light and in the Kootenay valley were injured by scab, which was equally prevalent there on apples.

The prices received for pears were highly remunerative; the demand in British markets was very keen, and there were growers in the Burlington district who received astonishingly high prices. The demand for pears in Great Britain is a reasonably steady one, and the success of shipments made in 1913 should be a model lesson to wideawake growers.

Cherries were a very satisfactory crop. Some of the earlier varieties in British Columbia were softened by continued wet weather and rendered unfit for shipment, but the later sorts were in excellent condition. In eastern Canada the crop was quite as large as any harvested in previous years and the quality good.

For most of the small fruits the season was a disastrous one. Wet weather in British Columbia, continued drouth in Eastern Canada and early frosts in the Niagara district, generally lowered the strawberry crop. In some sections it was a complete failure, and the average for the Dominion was not more than 60 per cent of a full crop. Raspberries, too, were a short crop, though greatly helped by rains early in July. Currants and gooseberries were a good crop.

DISTRIBUTION.

The spread of co-operation in the past few years has been a rapid one and an extremely successful one, except in one or two instances where failure has been due either to improper management or to organization under wrong principles. In every fruit-producing province, co-operation has undoubtedly gained a permanent foothold and a high reputation even among its former critics. Its advantages have been manifold. The members of co-operative associations have received very satisfactory prices for their fruit, and prices which have been much in advance of those paid to independent growers. In years of poor quality they have been able to dispose of their lower grades of apples at satisfactory figures and in quantities which would have been impossible under ordinary methods of marketing. Uniform grades have been adopted. Straight cars of the more popular varieties have been shipped where

mixed cars had formerly been handled. The merchants and the consuming public have consequently received fruit of higher quality, better packed and of more uniform grade than ever before.

It is only within the past three years that these individual co-operative associations have become organized into central selling associations under capable management and with definite methods of distribution. In Nova Scotia, the United Fruit Companies were organized in 1911 and the Co-operative Fruit Growers of Ontario and the Okanagan United Growers of British Columbia were both formed during 1913. Undoubtedly the principal objective point of all such organizations should hinge upon improved distribution. No other feature of the fruit industry has been given more publicity, and no publicity has been more deserved, than this one. The scarcity of fruit in out-of-the-way places in years when the same fruit has been rotting at the points of production, has been due only to faulty distribution. The "gluts" which have been experienced in our leading markets practically every year are not the result of over-production but of poor methods of handling. The tremendously wide margin between prices paid *to* the grower and *by* the receiver are as much due to inadequate distributive methods as to the much abused middleman.

Let one instance of this be cited. In 1913 there were towns in the middle west which were literally starving for apples. Contracts for fruit had been made with reputedly honest companies, but as the season advanced these companies were offered higher prices by firms in the Old Country. The contracts in the west were deliberately broken, and in cases where a town may have been dependent for its entire supply upon one or two cars, this breach of contract was a serious and disappointing matter. There were several instances of this. Some of the contracts were filled at a later date when prices dropped abroad. Some were never filled. This cannot be too severely critized. The success of a selling agency of any kind depends primarily upon honesty, and unless its main principle is "honesty first," and unless it maintains that principle, it cannot stand the test of time.

DEVELOPMENT OF THE EXPORT TRADE.

With the increase which has steadily taken place in fruit areas, it has become expedient for growers not only to systematize the distribution of their products in Canada, but also to make some study of the demand in other countries, and the means of catering to that demand. In Great Britain there has been for many years an excellent market for Canadian apples and pears, and within recent years a trade in peaches has also been created. The bulk of the apples is received from Ontario and Nova Scotia, although British Columbia has sent some shipments, and Quebec has also exported a small quantity. Reference has already been made to the excellent prices which were received for pears in 1913, and emphasis must be laid on the wisdom of developing that trade and supplying it with only the best fruit.

British Columbia has already developed quite a large trade with Australia, and in the season of 1913 exported over 31,000 boxes of apples to that market. The consumer in Australia seems to demand an apple medium to small in size, and some difficulty was reported to have been experienced in British Columbia in packing a suitable size without violating the requirements of the Fruit Marks Act for No. 1 apples. R. G. L. Clarke, chief inspector for British Columbia, referring to the Australian trade, reports as follows:—

> While it is true that that trade calls for a smaller apple than most markets, yet the grading must be strictly adhered to as laid down in section 321 of the Inspection and Sale Act. British Columbia, Washington and Oregon are all shipping to the same market, on the same steamers and practically the same varieties of apples. They ship either No. 1 or No. 2, or Extra

Fancy and Fancy, according to the grading rules of the association packing and shipping the fruit. If 175 is the smallest apple they pack in the Extra Fancy and No. 1 grade in Washington and Oregon, it is suicidal for British Columbia to try to grade down to 200 and 225 (and in some cases even smaller) for No. 1, and expect to successfully compete and hold their place in the markets. With the Western States raising their standards year by year on account of our competition, we must do the same in British Columbia, and the market must not be jeopardized either by selfishness or ignorance. I believe that the sizes most acceptable to the Australian trade are from 138 to 175 per box. Smaller sizes may be shipped, but they must be placed in the grade to which they belong.

South Africa has received fruit from Nova Scotia and also from British Columbia. That country would seem to be a very good one for Nova Scotian growers, for it is nearer the port of Halifax than Australia is to Vancouver. The box package appears to be more popular there than the barrel, and for that reason British Columbia fruit has hitherto found much favour. Nova Scotia growers seem to have already realized this, for in 1913 there were 7,271 boxes exported to South Africa from Halifax as against 2,291 barrels.

Continental Europe also receives a considerable quantity of apples from Canada, as will be noticed in the tables elsewhere in this report. There is every likelihood of that market being extended.

BOX PACKING IN ONTARIO.

A very large quantity of Ontario apples is shipped every year to the prairie provinces, and in Alberta and Western Saskatchewan (though in Manitoba and Eastern Saskatchewan to a smaller extent) it comes into direct competition with the apples of British Columbia and the Western States. The fruit from the latter sources has always been packed in boxes. Great care has been given to grading, to packing and to packages, with the result that the consumer has received an article of high quality, carefully packed in an artistic package. Boxes have gained so much popularity in the western market that Ontario growers who wished to cater to that market, have been forced to adopt it, and the number of boxes sent from Ontario to the west is increasing every year. Some of the more progressive growers have been successful in their efforts to pack apples skilfully in boxes, but by no means all of them. Lack of proper training has prevented some from putting up their fruit in the most attractive manner, and it has not always compared favourably with fruit packed in the west, with which it comes into competition. Until some further educational campaign is organized, we cannot expect our Ontario growers to pack apples in boxes with the same skill as growers who have never packed them in any other package.

To give a clearer idea of the situation in Ontario and in the West, extracts follow from the reports of our chief fruit inspectors in both districts:—

R. R. Waddle, Western Ontario.—"A great many Ontario growers have adopted the commercial box for the shipping of their fruit. There is no doubt a great demand for our boxed apples in the Canadian west, and a small percentage of the growers who have adopted this method of putting up their fruit, have gained a reputation for their own brand and are receiving a good price for their product. A very large percentage of the growers, however, never got away from the habit of packing with a ten per cent margin for inferior fruit, which had been their custom when packing barrels. The situation at the present time, then, is that many people buy the Ontario box with ten per cent of defective fruit. I have noticed many cases in Toronto where commission merchants had emptied the boxes into barrels and received a better price for the fruit.

The commercial box being a neater package than the barrel, consumers would doubtless expect a better sample in a No. 1 box than in a No. 1 barrel, but if on opening a box of 100 apples they find ten defective specimens, they are not likely to again buy an Ontario box."

C. W. Baxter, Prairie Provinces.—"Ontario boxed apples showed a marked increase in number over any previous year, and while a few of these shipments compared most favourably with the Pacific coast packing, the greater number did not. In fact, the quality of the fruit was no better than that of the very ordinary barrelled stock, and the packing very poor.

"The consumer and retailer in buying fruit in barrels do not compare it with boxed fruit, but when, on the other hand, they buy boxed fruit from Ontario, they naturally compare it with the boxed fruit which they have been accustomed to buy from the Pacific coast, and they are very much disappointed if the comparison is not a favourable one. Last season, owing to the looseness of the pack, Ontario boxes did not contain the full weight. This is quite a consideration to the retailer who follows the custom in this market and sells his fruit by the pound. If eastern shippers of boxes expect to compete successfully in this market with western shippers, there must be considerable improvement in the quality of the fruit and in the style of the pack. There is undoubtedly a demand for the eastern grown apple in this market, but not in the manner in which they have been put up during recent years."

FRUIT INSPECTION.

A more comprehensive idea of the conditions which apply in the several provinces, and of the work done by the inspectors in each, will be given by a summary of each province in turn.

British Columbia.—The work of inspection was carried on under the direction of R. G. L. Clarke, who was assisted by three inspectors. These three covered Vancouver Island, the lower mainland, the Kootenay valley and points on the Crow's Nest line. Mr. Clarke had charge of the Okanagan valley.

British Columbia has developed her fruit industry very rapidly, and in 1913 a central selling agency was established in the Okanagan valley. Reporting on this Mr. Clarke writes: "The co-operative movement took a great step in advance with the organization of the Okanagan United Growers, comprising eight unions, with a central selling agency at Vernon under the management of R. Robertson. The soft fruits, such as cherries, apricots, peaches, plums and early apples, were mostly assembled at Vernon, where mixed cars were made up to supply the trade. Some few straight cars were shipped from Penticton, Summerland and Kelowna, and I was pleased to hear some of the Vancouver wholesale men speak very highly of cars of peaches and plums from the Okanagan, placing them among the best on the market this past season. During the season 1913-14 the Okanagan United Growers marketed about one-half the fruit in the district in which they operated, handling 42 per cent of the apples alone. Besides bringing the growers increased returns for their fruit, large savings were realized by purchasing supplies such as feed, flour, fertilizers, &c. Over $10,000 has been saved in the purchasing of boxes alone. Although there was a good deal of criticism as to the methods adopted during 1913, it is pleasing to note that all the local unions were unanimous in endorsing the management and continuing their affiliation with the central selling agency."

A pre-cooling plant was established at Summerland in 1913 by the Provincial Department of Agriculture, having for its object the cooling of peaches and other soft fruits prior to shipment in iced cars. Mr. Clarke adds: "A number of investigations are being taken up along this line, prominent among which are the

holding up of two or three days' pack for shipment in carload lots, and the adoption of the Brine Tank refrigerator cars for the fruit transportation. The season's work along this line was most satisfactory, as ten carloads of peaches were made up and shipped in this manner. Those shipped in Brine Tank cars carried in splendid shape, with one exception. The experiments indicate that to ensure the soft fruit against loss in transit, it is necessary to handle it promptly and place it in a low temperature as soon as possible after it is taken from the trees, and the solution of the problem is to equip cold rooms at the point of shipment, where carloads may be sent out."

Prairie Provinces.—Inspection in the prairie provinces is entirely different to that in any other section of the Dominion. Here the inspectors are in contact with fruit at the consuming end, and in a district where fruit from Eastern and Western Canada and from the United States is in competition.

This district, covering a very extensive territory, and directed by C. W. Baxter, is divided into nine subdistricts, with headquarters at Fort William, Winnipeg, Brandon, Regina, Medicine Hat, Lethbridge, Calgary, Edmonton and Saskatoon.

One of the most interesting features of the western trade in 1913 was the development of traffic in peaches with Ontario. The crop last year was a particularly heavy one. Many of the eastern markets were 'glutted,' and it was the first year in which this fruit had been sent to the west in straight carload lots. Mr. Baxter reports the situation as follows:—

"As a result of the very large peach crop in the Niagara district and on the Pacific coast, the market was at times much overstocked. The six-quart basket has become a very popular package here, and it is doubtful if there is at present a more suitable one for wide distribution. Shipping to the West in eleven-quart baskets (peaches, tomatoes, plums, etc.) should be discouraged. The weight on the fruit at the bottom of the package is too great, and results in bruised and decayed fruit and 'sloppy' packages. Some peaches which arrived in eleven-quart baskets, heaped up and covered with leno, were so bruised and decayed that they sold for little more than those in six-quart baskets.

"There was a very noticeable increase in the number of peaches from Ontario packed in boxes. The fruit was packed with excelsior at the bottom, sides and ends of the boxes, and while this protection may be necessary when shipping by rail and steamer, there is no apparent need for it when the shipments are all-rail and in carload lots. It is pleasing to note that most of these shipments arrived in excellent condition. The fruit was of good colour and compared most favourably with the best Pacific coast shipments.

"In the course of our work we have noted the different methods used in loading, and there are a number of growers who have not mastered this difficulty. Greater care should be observed. Several cars have reached this market loaded the full length, with no space whatever in the centre and without braces. The baskets received the full force of every 'Shunt' and this resulted in broken and bruised fruit."

Mr. Baxter also includes in his report some very interesting material as a partial explanation for the difference between the prices paid by the consumer and those paid to the grower: "It is universally agreed that this difference is too great. At the same time it must be remembered that it does not always mean profit. A considerable portion must go to pay losses caused either by decay in transit or otherwise. In order that the distributor may remain in business he must charge these losses to future shipments, whether they be of the same commodity or of another variety of fruit."

Reporting on the apple situation Mr. Baxter writes: "In 1913 the merchant in the West experienced some difficulty in securing sufficient fruit. Very few apples were received from Nova Scotia, and practically no early varieties from any of the eastern provinces. The merchants therefore depended for these apples upon the states

of Wisconsin, Missouri and Iowa. Prices for winter apples remained very firm throughout the entire season. There was a considerable decrease in the quantity of apples received in the prairies from eastern Canada. In 1912-13 the amount was 256,000, and last season only 181,000, a decrease of 75,000 barrels."

Ontario.—Owing to the continued illness of Col. W. W. Brown who had charge of the inspection work in eastern Ontario and Quebec, it was found necessary to give to P. J. Carey the temporary supervision of that district. This, in addition to his other duties, placed a great deal of responsibility and arduous work upon Mr. Carey, and he is to be commended for the tactful and energetic manner in which he carried it on. Following is an extract from Mr. Carey's report, covering the more important features of his work: "A number of orchard meetings were held during the year, at which I took up the pruning, spraying and thinning of fruit, the proper planting of trees, the selection of varieties for different localities, and all matters pertaining to the better methods of fruit culture.

"Instruction work in the packing of apples was carried on all through the winter months, both in orchards and in packing houses. In some instances this work took the form of visits to packing gangs in the orchards, and in other cases demonstrations of box and barrel packing were given.

"I spent a week at the Short Course at the Agricultural College, Truro, N.S., three days at Macdonald College Short Course, and four days at a packing school in Kentville, N.S. At all of these demonstrations were given in apple packing.

"A number of meetings have been addressed during the year, including Farmers' Institutes, Farmers' Clubs, Co-operative Associations, Annual Meetings of Fruit Growers' Associations, &c. Judging at exhibitions was also done."

The work which Mr. Carey mentions above was all undertaken at intervals when inspection work was not pressing. Regarding the progress which has been made in apple packing in Ontario, Mr. Carey writes: "While the number of prosecutions might indicate that packing methods were still faulty, yet it can be truthfully said that the great bulk of the packers are making an honest effort to comply with the law. Owing to the fact that in many orchards there was little, if any, fruit of No. 1 quality this season, it was difficult for packers to do good work."

In western Ontario the work of inspection was under the direction of R. R. Waddle, assisted by nine inspectors. This section is largely devoted to the production of apples, with a comparatively large section in the southern portion growing tender fruits. Apple trees are being continually planted, and Mr. Waddle's services have been frequently required for educational work, more particularly in the pruning of young orchards.

Quebec.—In the province of Quebec plantings of apples are again being made. Old orchards are dying out, and it is gratifying to know that the younger generation is making some effort to raise the industry to the place which it formerly occupied. Several co-operative associations have been formed in the principal fruit-producing sections, and these, assisted by the Pomological Society and the Provincial Government, have done much to place the industry on a sounder basis. There are several sections throughout the province which might be devoted to profitable fruit production, and in these it is hoped that considerable extension will take place.

During the active shipping season there were five inspectors at Montreal. At the close of navigation these, with the exception of F. L. Dery, were removed to points on Lake Ontario, where large quantities of apples had been stored for later shipment. During the winter months Mr. Dery conducted the inspection work in Montreal, and visited from time to time other points of consumption throughout the province.

New Brunswick.—The province of New Brunswick does not yet produce sufficient apples for home consumption, but the industry is expanding every year. Fruit land is comparatively cheap and excellent markets are close at hand, so that the development of this province as a fruit producing area may reasonably be expected. Much is being done in the extension of the small fruit industry, which is a very important one in the St. John River valley.

The enforcement of the Fruit Marks Act in New Brunswick is in the hands of S. L. Peters, who, in addition to his work of inspection, has done much educational work during the past few years. As a result of this, spraying and pruning have now become quite general, better fruit is being grown, and it is being graded and packed in a more careful manner.

Mr. Peters states that the number of apples exported from the Port of St. John during the past season was 20,030 barrels and 3,551 boxes, mostly grown, of course, in Ontario.

The standardizing of small fruit packages is a subject which has been given considerable attention in New Brunswick, and Mr. Peters has done a great deal of work in this connection. He reports as follows: 'A determined effort was also made to have the berry-box makers place none but the full quart box on the market. Much time was given to this effort, and I am glad to say that it was a very successful one. There were a few small boxes in some crates of berries that were not noticeable until removed from the crate. Notes were made of these instances and close attention will be paid to those shippers in the future. Shipments of small fruits arrive in St. John by the Intercolonial railway, by seven steamers plying on the St. John river and its tributaries, and by private conveyances from within easy distance. During the height of the strawberry season, the seven steamers alone land from 350 to 500 crates (54 boxes per crate) every other day.'

Nova Scotia.—Probably no other province in the Dominion has made so great and so rapid an improvement in its methods of orchard management as has Nova Scotia. Within the past two or three years spraying has become one of the most important duties of the progressive fruit grower, and instead of the power sprayer being the novelty which it was a few years ago, it is now becoming the necessity which modern horticulture demands it to be. Power sprayers have taken their place in the Annapolis valley and are undoubtedly there to stay. It is true that during the seasons of 1912 and 1913 there was an immense quantity of No. 3 apples produced. It must be remembered, however, that spraying is not yet by any means practised by every grower, that both 1912 and 1913 were unusually wet seasons and that conditions were consequently ideal for the development of fungous diseases and far from ideal for satisfactory and efficacious spraying. It is an indisputable fact that in a section where such a disease as apple scab is prevalent, the only satisfactory means of combating it and holding it in check, is the persistent application of recognized spray mixtures.

In the matter of thinning, too, Nova Scotia is making progress. Before experimental work was done in the thinning of fruit, it appeared a rather wasteful operation to remove between 15 and 25 per cent of the crop during the earlier stages of its development, but so satisfactory have the results been of this experimental work that growers are becoming more and more impressed with its importance.

G. H. Vroom had charge of the inspection work in Nova Scotia, assisted by ten inspectors. Six of these were stationed at the port of Halifax, two in the Annapolis valley, one in Cape Breton island and one in the counties of Lunenburg, Queens, etc.

The season of 1913 was an unfavourable one throughout the entire province, due to a mild spring followed by a cold period in May. Weather was unfavourable for pollenization and ideal for the growth of fungous diseases. The result was a light crop of inferior quality. A more complete report of the season in Nova Scotia is given under the heading 'Fruit Crop Report.'

The following table prepared by Mr. Vroom gives the production of apples in Nova Scotia, and the main sources of consumption:—

Destination.	Barrels.	Boxes.
London	272,203	2,606
Liverpool	126,664	5,989
Hamburg	39,230	945
Glasgow	30,595	732
Newfoundland	11,423	
Hull	3,278	
South Africa	2,291	7,271
Manchester	16,947	
Cardiff	53	
Birmingham	78	
Stockholm	50	
Aldershot	152	
Bermuda	1,288	
Via St. John, N.B.	7,995	1,600
Boston *via* Yarmouth	954	
Total export	513,201	19,143
Points on I.C.R	76,319	
N.B. local	25,000	
Halifax local	30,000	
Total crop	644,520	19,143

COMPARATIVE STATEMENT FOR FIVE YEARS.

Year.	Barrels.	Boxes.
1909-10	834,207	4,885
1910-11	321,513	3,161
1911-12	1,730,496	10,011
1912-13	983,229	24,199
1913-14	644,520	19,143

Prince Edward Island.—The province of Prince Edward Island grows only a comparatively small quantity of fruit, and practically none of it is exported. C. M. Williams, fruit inspector for the province, has consequently devoted most of his time to demonstration orchard work, attending meetings, &c. There seems to be no reason why this province should not extend its orchard acreage. High-class fruit—both large and small—can be grown, suitable fruit land is abundant, and excellent markets are quite close at hand.

AMENDMENT OF 1913.

In June, 1913, an amendment was made to the Inspection and Sale Act, Part IX, stating in part:—

"*Regulation 3.*—Every importer of fruit, or his representative, shall cause all grade marks as found on closed packages containing imported fruit to be completely removed, erased or obliterated when such grade marks are different to, or inconsistent with, the marking or branding required by sections 320 and 321 of the Inspection and Sale Act, or section 4 of these regulations.

"*Regulation 4.*— Every importer, or his representative, of fruit shall cause all closed packages containing such imported fruit to be marked or branded in a plain and legible manner, in letters and figures not less than half an inch long, and in the following form:—

{ Place here the proper grade marks. }	{ Place here the correct name of the variety. }

IMPORTED BY

(Insert here the name and address of the importer.)"

In view of the fact that the greater part of imported fruit is marked in the prairie provinces, it may be interesting to quote from the report of Mr. Baxter, who had charge of the work in that market, in this connection: "Most of the fruit imported into this district is grown in the four northwest states of Washington, Oregon, Idaho and Montana, the latter being the only one with legislation which provides for the marking and for the grade marks, which are 'Extra Fancy,' 'Fancy' and 'Choice.' These are recognized by the trade to be equivalent to the Canadian grade marks 'Fancy,' 'No. 1' and 'No. 2.' The grade mark 'Choice' is the only one which is not very clearly defined. While its definition contains certain specifications, it also provides that 'this grade is provided to be used when market requirements justify'; 'this grade to be packed in accordance with trade requirements'; 'this grade shall be made up of all *merchantable* apples not included in the 'Extra Fancy' and 'Fancy grades.' In the states of Washington, Oregon, and Idaho, the majority of associations and individual shippers have adopted the same grade marks which are used in Montana, although a few use the designations of 'First Grade,' 'Second Grade' and 'Third Grade,' and some 'No. 1,' No. 2' and 'No. 3,' which are also recognized by the trade to be equivalent to the Canadian grade marks 'Fancy,' 'No. 1' and 'No. 2'."

BETTER FARMING SPECIAL.

During part of July and August the New Brunswick Government again ran a "Better Farming Special" through the farming sections of the province. Demonstrations and lectures were given by competent men on all phases of modern agriculture. Our fruit inspector for New Brunswick, Mr. S. L. Peters, accompanied the train. Meetings were addressed at the following points:—Keswick, Millville Station, Woodstock, Hartland, Florenceville, Bath, Red Rapids, Plaster Rock, Perth Junction, Harvey Station, St. Andrews, St. Stephen, St. George, St. John, Welsford, Hoyt Station, Canterbury, Fredericton Junction, and Rusagornish.

The total attendance at these meetings was 5,000.

The Ontario Government also conducted a similar series of meetings, at four of which (Belmont, Tillsonburg, Brampton, and Streetsville) Mr. P. J. Carey gave addresses.

MEETING OF CHIEF FRUIT INSPECTORS.

During the first week in May a meeting of the chief fruit inspectors from the various districts was held in Ottawa. A great deal of very helpful discussion took place regarding the provisions of the Inspection and Sale Act, and uniform opinions were formed of clauses upon which the inspectors had previously been, to some degree, at variance. Visits were made to the large fruit merchants in the city of Ottawa, and

test inspections made in order that those having charge of this work might agree upon certain standards for the various grades and transfer their interpretation of these standards to the inspectors under their jurisdiction.

Those present were: G. H. Vroom, for the Maritime Provinces; W. W. Brown for eastern Ontario and Quebec; R. R. Waddle for western Ontario; C. W. Baxter for the prairie provinces; R. G. L. Clarke, for British Columbia; P. J. Carey, Dominion apple packing expert and those in Ottawa having supervision of this work.

APPENDIX IV.

REPORT OF THE CHIEF OF THE DAIRY DIVISION.

MR. GEO. H. BARR.

The most important work carried on by this division is that of cow-testing. There is no other aspect of the dairy industry to-day in which there is as much room for improvement as that of increasing the quantity of milk from the dairy herds and it is gratifying to note the increased interest that is being taken all over the Dominion in the testing of the individual cow. Dairy farmers are beginning to realize the advantage of *knowing* just what each cow is doing in her business of producing milk. Our cow testing work was extended considerably during the year, especially in the establishment of dairy record centres.

On March 31, 1913, there were eighteen dairy record centres in operation. On March 31, 1914, there were thirty-one dairy record centres, fourteen in Ontario, eight in Quebec, two in Prince Edward Island, four in Nova Scotia, two in New Brunswick and one in Saskatchewan. Several of these were established since January 1, 1914, and, of course, are only getting nicely into work for the coming season. In all these centres there is a recorder appointed by the department who devotes his time to visiting the farms, testing the samples from the individual cows and assisting the dairymen to improve their herds by improvement in feeding and breeding. The number of farmers keeping feed records is increasing every year. Getting the dairymen to keep an accurate account of the feeding of their cows is not always an easy thing to accomplish, but we believe it is one of the most profitable lines of work the recorders can follow. We are pleased to note, however, that the number of farmers keeping feed records is increasing each year and also that the use of pure-bred bulls is becoming more general.

In addition to the dairy record centres there are a great many cheese factory and creamery proprietors and makers in the different provinces who have patrons weighing and sampling the milk from their herds and bringing the samples to the cheese factories or creameries to be tested.

On March 1, 1913, Mr. H. W. Coleman, who had charge of the Perth record centre for two years, was appointed supervisor of the cow-testing work in Ontario with headquarters at Perth, Ont., and he has filled the position very satisfactorily indeed.

On July 1, 1913, Mr. I. Trudel, who had been supervisor in the province of Quebec, resigned. Mr. J. B. Trudel was appointed as his successor on January 1, 1914. Mr. Trudel is well qualified for the work, being well acquainted throughout the province and has had a wide experience in dairying.

REPORT OF THE DAIRY SUPERVISOR FOR THE MARITIME PROVINCES.

In the maritime provinces, the work is under the supervision of Mr. Harvey Mitchell, with headquarters at Charlottetown, P.E.I. It is gratifying to note the increased interest which is being taken in dairying in these provinces. The following is Mr. Mitchell's report:—

CHARLOTTETOWN, March 31, 1914.

I hereby submit a short report on the dairy industry in the Maritime Provinces.

In reference to the cow-testing work there is a very general demand in the three provinces to have this work extended. At the present time, I have applications from several different sections wanting the work established outside of the record centres, principally in connection with agricultural societies and creameries. A few years ago I never received any applications of this kind. As to the results of the cow-testing work carried on by the Dairy Division, I could give a great many farmers' names who have doubled their returns per cow from the creamery in five years. I know of one creamery where there were over thirty patrons who received double the amount of money per cow from the creamery last year than they received five years ago. All these patrons have been doing more or less cow-testing while the other patrons at the same creamery who have not been following up cow-testing show little or no increase in their returns per cow. The hard competitions in Prince Edward Island, for prizes offered by the Dairymen's Association, show in some degree the interest being taken in cow-testing work. The entries for these competitions are nearly all from sections where the cow-testing work has been carried on and from men who have been following up the work from year to year.

The prizes offered last year by the Dunstaffnage Creamery and again this year by them and others is further evidence of the interest taken in the work of herd improvement. The following is a copy of the rules and regulations governing prizes offered at Dunstaffnage this year:—

Dunstaffnage Dairying Association.

DUNSTAFFNAGE, P.E.I., March 1, 1914.

DEAR SIR,—Through the interest taken and the results attained from the competition last year in connection with the Cow-testing Association, prizes will be offered this year as follows:—

Class 1.—For patrons who furnished $250 worth or less of butter fat to the creamery in 1913.

To the patron who produces the first, second and third largest average amount of butter fat per cow from January 1 to December 31, 1914: 1st prize a silver medal; 2nd prize. $5; 3rd prize, $3.

Class 2.—For all patrons of the creamery.

To the patron who produces the largest average amount of butter fat per cow from the best six cows in his herd, from January 1 to December 31, 1914, a gold medal, donated by Dr. J. C. McDonald; and to the patron who produces the second largest average amount of butter fat per cow from the best six cows in his herd for the same period, a silver medal.

1. The patron must become a member of the Cow-testing Association.

2. No herd less than three cows will be allowed to compete in Class 1.

3. Figures will be taken from the Cow-testing Association record sheets as sent in by the patrons, and the directors of the association reserve the right for any of them or their representative to visit the farm of any competitor and make such verification as they may require.

4. No substitution of one cow for another will be allowed. A declaration must be made by each competitor as to the number of cows kept, that the weights of milk are correctly recorded and the samples taken according to the rules of the Cow-testing Association.

5. The average amount of butter fat per cow in class 1 must be calculated on the basis of the total number of cows that the patron has been milking at any one time during the twelve months, January 1 to December 31, 1914.

Example.—If a patron begins to keep records in January, February or March with say only two cows in milk, and in April or at any other time a cow freshens, and in May or at any other time, another cow freshens, making in all four (4) cows, the patron is not debarred from competing, providing the total number of cows (4) is used for dividing the total butter fat to find the average butter fat per cow for the year. Larger herds the same.

We appreciate the co-operation of our friends in the east who were shipping their cream in by rail last year and, in addition to being eligible to compete in class 1, we offer a silver medal this year to the patron shipping cream by rail, who becomes a member of the Cow-testing Association and furnishes the highest average pounds of butter fat per cow to the creamery from January 1 to December 31, 1914.

Rules No. 2 and 5 to govern this award.

Any further information can be had from the manager of the creamery, who will also supply the necessary outfits, &c.

Yours respectfully,

WM. J. GIBSON,
B. R. BROWN,
Committee.

While the number of patrons of factories in Prince Edward Island is less than a few years ago, the gross returns to the patrons last year showed an increase over 1912 and there is no question that the milk was produced at a greater profit than ever before. There will be one new creamery at Wellington which will open about the 1st of June. The prospects are bright for an increased quantity of cream being shipped in to Dunstaffnage Central creamery by rail from Kings county.

In Nova Scotia there was a decided increase in the output of creamery butter, nearly 50 per cent more than in 1912, due in part to increased milk production, but largely to the new creameries established and the shipping of cream in by rail to the creameries. New creameries were opened this year at Stellarton, Bridgewater and Baddeck. Each creamery will serve a large section of country and the output of creamery butter should show an increase of at least 50 per cent over that of 1913.

There was an increase in the gross returns for cheese and butter in New Brunswick over that of 1912, and I look for a greater improvement this year. In the parish of St. Louis, Kent county, the creamery has not been in operation for a number of years and through the interest worked up by the cow-testing work in the district last year, they have decided to open their creamery this season. This creamery and the Central creamery at St. Hilaire are the only new ones that will be opened in 1914.

HARVEY MITCHELL.

I regret to report the death of Mr. I. L. Farrington, which took place at Woodstock, Ont., on March 22, 1914. Mr. Farrington was one of the first men appointed as a dairy recorder in 1911, and he had charge of the Woodstock Centre up to the time of his death.

A compilation of the records of the different centres has been made by Mr. C. F. Whitley, which will be found in Appendix V.

THE BROME CREAMERY.

The Brome creamery in the village of Brome, Que., is operated upon the following basis: The Department of Agriculture owns the creamery and two skimming stations in connection therewith. The patrons deliver their milk and cream to the creamery and skimming stations, appoint and pay their own secretary-treasurer and salesman and deliver the butter to the station. The department pays all the other operating expenses and charges a commission on all butter manufactured of 2¾ cents per pound of butter from milk delivered, and 2½ cents per pound of butter from cream delivered. The patrons receive the skim-milk and buttermilk.

The new creamery was opened for buttermaking on December 13, 1912, and has been in operation continuously ever since. During the winter months the supply of milk and cream was so small that the creamery was operated for several months at a loss. The object of running the creamery during the winter months is to encourage the production of milk in the winter when prices are usually very high. The quantity of milk received during the winter of 1913-14 was considerably greater than in the winter of 1912-13 and we hope that each year the loss on winter work will become less. During the past winter part of the output was sold as cream.

SKIMMING STATIONS.

Thirty-two farmers in the district of Brome Centre petitioned the department to erect a skimming station on the site of the old Brome Centre cheese factory, which was burnt in the fall of 1912. The station was erected at a cost of $1,200. The building is 18 x 18 feet, constructed of wood, with concrete foundation and floor, and the roof finished with steel shingles. Milk was received at this station for the first time on May 12, 1913.

A similar petition signed by the patrons of the Owen's Corner cheese factory was received asking the department to either buy or assume control of the factory as a skimming station for the Brome creamery. The building, equipment and good-will of the business was purchased for the sum of $1,000. The first milk was received for skimming on April 9. The building was in very bad repair and, after consideration, it was decided that it would be more economical to build a new building than to try and repair the old one. A contract for the erection of a new wooden building 18 x 20 feet, with concrete foundation and floor and steel shingle roof, was let for the sum of $1,000.

The cream from both skimming stations is delivered to the Brome creamery by the man in charge at Brome Centre who provides the horse, the department providing the wagon, harness and cream cans.

Mr. V. West has been manager of the Brome creamery for two seasons.

I appreciate the interest and care that was taken in the work by those in charge at Brome creamery and skimming stations, especially with respect to the clean and attractive manner in which they have kept the buildings and surroundings.

Following is the statement of the business of the creamery and skimming stations from March 1 to December 31, 1913, prepared by the patrons' secretary and submitted to the patrons at their annual meeting held on March 12, 1914:—

Pounds milk received at Brome creamery	1,133,953
Pounds milk received at Brome Centre skimming station	485,255
Pounds milk received at Owen's Corner skimming station	675,157
Total pounds milk received..	2,294,365

Pounds cream received at Brome creamery	50,985
Pounds cream received at Brome Centre skimming station	13,516
Pounds cream received at Owen's Corner skimming station	4,247
Total pounds cream received	68,748
Total pounds butter fat in milk and cream received	102,688
Total pounds butter made	121,457
Total pounds cream sold	15,001
Total pounds fat in cream sold	5,996
Total paid patrons at Brome creamery	$19,199 24
Total paid patrons at Brome Centre skimming station	6,100 11
Total paid patrons at Owen's Corner skimming station	7,034 46
	$32,333 81

The patrons are paid every two weeks and the average net value per 100 pounds of milk was as follows:—Payment from March 1 to May 3, 84·3 cents to $1.09·4; from May 4 to August 24, 89·2 cents to 97·5 cents; and from August 25 to December 31, $1.08·4 to $1.64·7.

FINCH DAIRY STATION.

The Finch Dairy station has been in operation continually since the present building was opened on August 23, 1912. The work during the past year has been somewhat diversified. The equipment is such that both cheese and butter can be manufactured at the same time, or cream separated for shipment to the city. Butter was manufactured during the winter months of 1912-13 and up to June 14, 1913, with the exception of a few days when cream was shipped to Ottawa. Cheese was made from June 16 to November 18, 1913, with the exception of a few days in July and August when cream was again shipped to Ottawa. Butter was made from the Saturday nights' milk during the summer months. During July and August whey butter was made. Although every care was taken to keep the whey perfectly clean before separating, and a good culture used in the cream, the patrons preferred to pay 4 cents per pound more for the butter made from the cream skimmed from the Saturday nights' milk than for the whey butter. At the close of the cheese season, November 18, 1913, milk and cream was shipped to Montreal. One firm took the entire output of the station in milk and cream from December 6 to February 28, after which date they took only a limited supply of cream, the balance of the cream being made into butter.

Shipping milk and cream to Montreal during the winter months gave excellent returns to the patrons, as is shown in the annual statement. The patrons were required to take particular care to deliver clean sweet milk, which meant more work and greater cleanliness at the farms. It also meant extra equipment in the factory to handle and cool the milk and cream successfully. The prices received warrant the extra care necessary at the farms and also the extra equipment installed. The railway connections at Finch give the dairy station exceptional facilities for shipping milk and cream to Montreal and Ottawa.

The farmers in the Finch district never had an opportunity to dispose of their milk during the winter months until the station was established, and it is encouraging to report that the quantity of milk received during the winter of 1913-14 was almost

double that received in the winter of 1912-13. The factory is still being operated at a small loss during the winter months, but we are hopeful that as the farmers see the advantage of winter dairying, they will provide themselves more generally with silos, better stables and better cows and produce enough milk in the winter to at least pay operating expenses.

The department charges the usual commission for making cheese of 1¼ cents per pound, and 3 cents per pound for butter, and pays all operating expenses, including the salaries of the secretary and salesmen. Both the whey and skimmilk is pasteurized.

When the department commenced to operate the factory at Finch in the spring of 1912, there was not a single cow being tested in the neighbourhood. One patron commenced testing his herd during the summer. In 1913 samples from 103 cows were tested at the factory. During the winter a cow-testing club was organized and we expect that during the season of 1914 there will be in the neighbourhood of 200 cows under test. Several pure bred bulls have been brought into the district lately. The manager Mr. B. A. Reddick, deserves much credit for the development of this interest in cow improvement in the district, and I appreciate the interest and faithfulness with which he and his assistants have carried on the general work of the factory.

The following statement was submitted at the annual meeting of the patrons held on March 5:—

STATEMENT OF BUSINESS AT FINCH DAIRY STATION FROM NOVEMBER 20, 1912, TO DECEMBER 31, 1913.

Month.	Lb. of Milk.	Lb. of Fat.	Lb. Butter Made.	Lb. Cheese Made.	Lb. Fat in Cream Sold.	Gross Value.	Making Charge.	Paid to Patrons.	Net Value per 100 Lb. of Milk.
						$ cts.	$ cts.	$ cts.	$ cts.
November	22,287	944	1,093			338.83	32.79	306.04	1.02
December	55,280	2,412	2,723			813.20	81.69	731.51	1.49
January	17,406	681	790			248.32	23.71	224.61	1.29
February	21,631	748	845			263.01	25.35	237.66	1.09
March	114,620	3,642	4,418			1,354.73	132.54	1,222.19	1.07
April	199,066	6,246	6,733		557	2,140.06	218.70	1,921.36	.96
May	403,175	13,209	11,663		3,717	4,352.45	461.40	3,891.05	.96
June 1 to 16	268,274	8,907	10,582			2,650.05	317.46	2,332.59	.87
June 17 to 28	204,403	6,841	604	17,656		2,494.05	238.82	2,255.23	1.10
July	469,129	15,659	1,557	38,831		5,511.45	561.80	4,949.65	1.05
August	291,590	9,989	1,110	24,237	1,077	3,445.57	318.89	3,126.68	1.07
September	282,720	*15,754	1,217	23,700		3,485.53	332.76	3,152.77	1.11
October 1 to 22	234,330	*13,431	1,487	20,568		3,087.43	301.71	2,785.72	1.19
October 23 to November 17	119,642	7,403	2,150	7,819		1,653.96	162.24	1,491.72	1.25
November 18 to December 13	59,649		112			1,082.52	59.65	1,022.87	1.71
December 15 to 31	34,393					662.56	34.93	627.63	1.82
Total	2,797,595	105,866	47,084	129,811	5,351	33,583.72	3,304.44	29,279.28	1.04

* Fat + 2.

On account of the extra apparatus necessary in carrying on experimental work, it was found necessary in the spring of 1913 to build an addition to the factory for a storeroom.

EXPERIMENTAL WORK AT FINCH.—COMPARISON OF THE LOSS OR SHRINKAGE IN MAKING FULL-SIZED CHEDDAR CHEESE VS. FLATS AND TEN-POUND CHEESE.

Seven different lots were made in the months of June and July. Each lot consisted of two full-sized cheese, four flats and fourteen 10-pounders. The average weights were 77 pounds, 38 pounds and 11 pounds.

Exactly the same weight of curd was put into the different hoops in each lot from the regular factory curds, after being salted.

The cheese were paraffined on the seventh day after being taken from the press. They were kept in a cool curing room, the temperature never going above 62 degrees.

The average per cent of loss between the weight of the curd and the weight of the cheese when taken from the press was as follows: Full size, 6·23 per cent; flats, 6·66 per cent; 10-pounders, 7·22 per cent.

The following table gives the relative shrinkage of the cheese at the end of different periods after manufacture:—

—	7 Days.	14 Days.	21 Days.	28 Days.
	Per cent.	Per cent.	Per cent.	Per cent.
Full size	1.13	1.39	1.65	1.90
Flats	1.52	1.80	2 12	2.51
Ten-pounders	2.15	2 55	2.99	3.46

The following is the average per cent shrinkage between the weight of the curd and the weight of the cheese on different dates; also the price per pound each lot of cheese would have to sell for, to equal 12 cents per pound for the full-sized cheese.

—	Per Cent Shrinkage.	Price Per lb.
		Cts.
7th day—		
Full size	7.36	12.000
Flats	8.18	12.106
10 pounders	9.37	12.131
14th day—		
Full size	7.523	12.000
Flats	8.460	12.120
10-pounders	9.770	12.298
21st day—		
Full size	7.883	12.000
Flats	8 780	12.118
10-pounders	10.210	12.306
28th day—		
Full size	8 133	12.000
Flats	9.170	12.136
10-pounders	10 680	12.337

In addition to the loss in manufacturing, there is the extra work to be considered in making flats and 10-pounders.

WHEY BUTTER.

Whey butter was made in June, July and August. Extra care was taken to keep the whey perfectly clean before separating. A tin box was placed under the taps in the vats and the whey forced into the receiving vat in the creamery with an ejector. A pure culture was used in the cream. Notwithstanding this, the patrons preferred to pay four cents a pound more for the creamery butter than the whey butter. The principal fault found was that the butter became soft very quickly when put on the table in hot weather. The average pounds of whey butter made from 1,000 pounds of milk was 2·03.

INSULATED MILK AND CREAM CANS VS. ORDINARY CANS.

A number of tests were made to determine the efficiency of an insulated milk and cream shipping can, as compared with an ordinary can. The insulated cans are made with double sides and bottom, leaving a space of about one and a half inches which is filled with insulating material. In making the tests the cans were filled with water at 48 degrees and then placed in a warm room with the following average results:—

	8 A.M.		1 P.M.		5 P.M.		Increase of Temp.
	Temp. of Room.	Temp. of Water.	Temp. of Room.	Temp. of Water.	Temp. of Room.	Temp. of Water.	
	deg.	deg.	deg.	deg.	deg.	deg.	deg.
Ordinary cans	66	48	74.5	61	80.5	78	30
Insulated cans	66	48	74.5	51	80.5	55	7

The insulated cans cost $5 each, f.o.b. Chicago.

THE BABCOCK AND CASLIN TESTS.

A good deal of time was spent at the Finch Dairy station by members of the dairy staff in testing the patrons' milk for fat and casein, to ascertain the relation of casein and fat in the milk as shown by the Hart casein test and the Babcock test; also to get further information on the practicability of using the Hart casein test in paying for cheese milk under factory conditions.

SUMMARY OF THE WORK.

The men in charge of the work found it rather difficult to get duplicate tests of casein to read the same.

Correct and uniform temperatures are essential for accurate work with the Hart casein tester.

Variations in the temperature of the acetic acid made a greater difference in the test than did variations in the temperature of the milk or the temperature of the room in which the testing was done.

Low temperatures in the acetic acid gave too high readings and high temperatures too low readings.

Temperatures under 64 or over 70 degrees made a decided difference in the test.

We cannot yet see how a cheesemaker could do his regular factory work and test the milk for both fat and casein, thus making the use of the casein test practically impossible unless special help is provided.

The per cent of casein as shown by the Hart casein test does not vary to the same extent as the per cent of fat in herd milk.

There is no constant relation between the per cent of casein and the per cent of fat in herd milk, but when a large number of tests are averaged, the richer milk shows a higher per cent of casein than the poorer milk.

EFFECT OF DIFFERENT TEMPERATURES ON THE HART CASEIN TEST. ALL THE SAMPLES TESTED WERE FROM THE SAME MILK.

EFFECT OF DIFFERENT TEMPERATURES in the Milk and Acetic Acid.

DIFFERENT TEMPERATURE IN MILK.			DIFFERENT TEMPERATURE IN ACETIC ACID.		
Temp. of Milk.	Temp. of Acetic Acid.	Per Cent Casein.	Temp. of Milk.	Temp. of Acetic Acid.	Per Cent Casein.
62	65	2.6	70	62	2.7
64	65	2.5	70	64	2.5
66	65	2.6	70	66	2.5
68	65	2.5	70	68	2.5
70	65	2.5	70	70	2.5
72	70	2.6	72	73	2.4
74	70	2.6	72	74	2.2
76	70	2.5	72	75	2.3
78	70	2.5	72	77	2.3

These figures show that a variation of 16 degrees in the temperature of the milk had practically no effect upon the result of the test.

There is practically no variation in the percentage of casein with the acetic acid at temperatures between 64 and 70 degrees, but below and above these temperatures there is a decided difference, the test increasing as the temperature is lowered, and decreasing as the temperature is raised.

There was only a variation of 4 degrees in the temperature of the room when the above tests were being made, 66 to 70 degrees.

A few samples are given out of hundreds of tests made of the milk delivered to the Finch Dairy station to show the variations that may occur in the per cent of fat and casein from day to day in herd milk.

Patron's Number.	—	Dates.						Averages.
		May 13.	May 14.	May 15.	May 20.	May 21.	June 12.	
1	Per cent fat	3.2	3.4	3.5	3.6	3.8	3.2	3.616
	" casein	2.3	2.2	2.5	2.3	2.4	2.5	2.366
2	Per cent fat	3.4	3.9	3.1	3.5	3.3	3.3	3.416
	" casein	2.2	2.6	2.4	2.3	2.3	2.5	2.388
5	Per cent fat	3.5	3.6	3.8	3.3	3.6	3.4	3.533
	" casein	2.1	2.4	2.5	2.5	2.5	2.8	2.466
9	Per cent fat	3.7	3.7	3.9	3.4	3.6	3.3	3.583
	" casein	2.6	2.6	2.5	2.6	2.6	2.4	2.550
12	Per cent fat	4.0	4.2	4.1	4.2	4.0	4.0	4.083
	" casein	2.2	2.6	2.4	2.6	2.4	2.5	2.450
15	Per cent fat	3.9	3.6	4.0	—	3.5	3.5	3.700
	" casein	2.6	2.4	2.3	—	2.5	2.4	2.440

These figures show that there is certainly a wide variation in both the fat and casein in herd milk as delivered to the ordinary cheese factory from day to day. We had no control over the care of the milk at the farms and, therefore, cannot give any reason for such variation in the fat test. The samples were taken from the weighing can as soon as the milk was poured into it from the patrons' cans.

In the milk from twenty-four patrons, tested seven times between May 21 and June 12, there were the following differences between the highest and lowest tests of fat and casein:—

Fat Test.		Casein Test.	
No. of Patrons.	Greatest Variation.	No. of Patrons.	Greatest Variation.
	Per cent.		Per cent.
1	·7	1	·5
2	·6	8	·4
4	·5	1	·35
11	·4	6	·3
1	·3	7	·2
5	·2	1	·1
24		24	

The average difference in the twenty-four fat tests was ·4 per cent.
The average difference in the twenty-four casein tests was ·306 per cent.

GEO. H. BARR.

APPENDIX V.

DAIRY RECORD CENTRES AND COW-TESTING.

During the year 1913 the general plan of cow-testing, as carried on in previous years by the Dairy Division, took a firmer grip on farmers. Many more records of individual cows have been received and compiled; and, judging by the greatly increased demand for milk record forms, especially those for daily weights, from farmers who keep their own records not sending them in to this office, this simple, common-sense plan of checking up the production of each cow in the herd is becoming a widespread practice.

The number of dairy record centres has been increased, and the recorders in charge at each centre speak unanimously of the vital interest taken by farmers in cow-testing.

Records were received of 15,946 cows owned by 1,686 dairymen. It is unfortunate that again this year many records have been kept for only a few months of the year. May we emphasize once more that in order to arrive at a fair knowledge of a cow's real value the record should be kept for the full period of lactation.

If cow-testing is to mean anything of real help to dairymen, it is self-evident that something more must be done than take a few weights and samples of milk at intervals, that is simply one means to the end in view. Substantial improvement of the herd is the object sought, accomplished first by weeding out the poorest cows, as discovered by their records. But cow-testing is doing far more than this. Notes will be found below not only of increases in the yield of milk and fat per cow, but of decided improvements in the whole tenor of dairy farming. For the use of the scales proves that better feeding, better breeding and better care of stock are things that pay and pay well. Hence it will be seen how remarkably far-reaching is the beneficial influence of cow-testing, especially when aided by the presence of the recorder.

CONTRASTS IN THE SAME HERD.

It is quite possible to find such strange variations in the production between cows in the same herd that it is a matter of astonishment that owners have not discovered long ago how altogether unsatisfactory it must be to take simply an average of all cows together. This will apply to the yield of one milking, or a day, week, month, or year. For when once part of all of the milk of all the herd is mixed in one can, it has passed beyond the stage when the spring scale in the stable will be of benefit. To reap the best results each cow's milk should be weighed regularly and separately.

What satisfaction can there be in striking an "average" when the individual yields for the year are as far apart as 12,535 pounds and 3,990 pounds? In other herds these differences are 5,922 and 1,620 pounds, 8,610 and 2,320 pounds, 11,955 and 4,460 pounds between cows in the same herd.

In yields of a month it is often found that one cow gave more milk and fat than two other mature cows.

A comparison of records discloses facts that are remarkable. On one Ontario farm are found four cows, ages 12, 8, 5 and 4, that averaged during their entire lacation period only 2,344 pounds of milk, and 85 pounds of fat. On the register are a few cows that gave 5 and even 10 pounds of fat more than that in just *thirty days*.

TABLE 1.—Summary of all cows recorded for the Full Period of Lacation, 1913.

Province.	Number of Herds.	Number of Cows.	Average Yield.		
			Milk.	Test.	Fat.
			Lbs.		Lbs.
Ontario	554	5,643	5,513	3·6	200·1
Quebec	260	2,532	4,512	3·9	176·2
New Brunswick	136	986	4,250	4·0	170·2
Nova Scotia	52	248	4,969	4·3	214·9
Prince Edward Island	60	389	5,261	3·9	203·1
Total	1,062	9,848	5,273	3·6	191·7
Weights only	22	244	5,893		

At the dairy record centres in the following tables the testing was done by the official recorder in charge at each centre; at the other points, or for each cow-testing association, the testing was done by the maker at the local factory.

TABLE 2.—Average Yields of Cows recorded for the Full Period of Lactation in the Province of Ontario, 1913.

Electoral District.	Name.	Number of Herds.	Number of Cows.	Average Yield.		
				Milk.	Test.	Fat.
	Dairy Record Centres.			Lb.		Lb.
Stormont	Avonmore	56	695	5,209	3.4	178.7
Glengarry	Alexandria	32	392	4,699	3.5	167.9
Grenville	Farmers' Union	50	448	5,850	3.4	201.7
Hastings	Frankford	46	422	6,431	3.4	223.3
Kingston	Kingston	24	330	6,162	3.3	204.8
Perth	Listowel	55	568	6,379	3.3	213.6
Brockville	Mallorytown	26	410	5,729	3.5	199.7
Carleton	North Gower	52	482	5,362	3.4	186.4
Lanark	Perth	43	397	5,089	3.4	175.7
Peterborough	Peterborough	57	483	6,209	3.4	214.0
Woodstock	Woodstock	20	233	7,240	3.5	252.5
	Cow Testing Associations.					
Durham	Port Hope	2	9	4,805	3.5	169.9
Dundas	Winchester	1	17	5,633	3.3	196.5
Grenville	Prescott	2	38	6,905	3.3	227.4
"	Spencerville	1	16	4,841	3.6	176.4
Glengarry	Tyotown	4	38	6,026	3.7	224.0
Ontario	Whitby, Weights	1	10	4,838		
Peel	Star	1	8	6,614	3.1	204.5
Prince Edward	Consecon, Weights	1	12	4,768		
Russell	Dalmeny	2	27	5,015	3.5	177.4
Renfrew	Renfrew	1	10	5,900	3.4	206.0
"	Navan	4	56	5,447	3.5	191.6
Stormont	Finch	8	76	4,742	3.5	165.9
Algoma	Gore Bay	3	15	4,581	3.5	162.5
"	Silver Water	1	6	4,436	3.7	167.6
Brant	Alford Junction	1	12	8,957	2.8	251.3
"	St. George	1	17	6,740	3.2	217.6
Haldimand	Dunnville	1	3	4,601	3.3	153.6
"	Selkirk	1	3	3,822	3.9	150.5
Halton	Milton	1	3	6,250	4.0	250.0
Lambton	Forest	3	14	6,011	3.6	216.1
Lincoln	Silverdale	14	71	5,816	3.8	227.0
Norfolk	Port Royal, Weights	1	5	6,747		
Oxford, N.R.	Cassel	2	22	7,464	3.3	246.4
"	German Union	5	29	5,765	3.2	186.3
"	Innerkip	3	46	7,471	3.2	241.4
"	Tavistock	2	12	5,516	3.2	175.6
Perth	Avonbank	4	40	6,224	3.3	209.1
"	Black Creek	4	39	6,273	3.2	205.8
Waterloo	Baden	1	7	4,569	4.0	185.9
Welland	Bertie	2	14	6,034	3.6	222.3
Wellington	Guelph	16	132	6,308	3.4	219.1
"	Guelph, Weights	1	9	8,232		
General average for the Province—						
Weights and tests		554	5,643	5,513	3.6	200.1
Weights only		18	193	6,086		

NOTE.—This table, and the similar table for each province, should contain a great many more cows, but it does not because records were received of a great number of cows for only four or five months.

In the cow-testing associations at Avonbank, Alford, Black Creek, Cassell, Guelph and Prescott, Ont., are several individual yields of over 10,000 and 12,000 pounds of milk and 330 pounds of fat.

While the average at Avonmore dairy record centre is 5,209 pounds of milk and 178·7 pounds of fat for 695 cows in 56 herds, the variations in the divisions are all the way from 4,619 pounds of milk and 157·9 pounds of fat per cow for 50 cows, up to 6,194 pounds of milk and 208·8 pounds of fat per cow for 39 cows. The difference is thus 1,575 pounds of milk and 50 pounds of fat per cow.

One of the best herds is at Glenelg, where 7 cows average 7,308 pounds of milk and 252·7 pounds of fat per cow. This herd includes some individual yields of over 8,000 pounds of milk and 290 pounds of fat per cow.

In other herds, as at Gravel Hill and Boundary, are low yields of only 3,200 pounds of milk and 118 pounds of fat per cow.

In the Alexandria dairy record centre one of the best herds gives an average for 9 cows of 5,322 pounds of milk and 197 pounds of fat. One of the poor herds has an average yield for 11 cows of only 3,085 pounds of milk and 116 pounds of fat.

There are a few good individual yields as at Pine Hill and Glengarry of 6,600 pounds of milk and over 240 pounds of fat.

The Farmers' Union dairy record centre includes some good averages. For instance, 48 cows in 7 herds at Oxford Mills yield 6,368 pounds of milk and 214 pounds of fat. One herd of 18 cows at Patterson's Corners has an average of 7,543 pounds of milk and 239 pounds of fat.

Some good individual yields are 9,725 pounds of milk and 300 pounds of fat; 10,474 pounds of milk and 345 pounds of fat; 12,367 pounds of milk and 441 pounds of fat.

In one herd where the average of 15 cows stands at 8,933 pounds of milk and 291 pounds of fat, there are 7 individual yields of over 300 pounds of fat and one of 417 pounds.

At the Kingston dairy record centre are several individual cows with less than 150 pounds of fat, while some run up as high as 402 and 463 pounds. In one herd of 26 cows only two individuals give 200 pounds of fat and 9 cows give less than 4,000 pounds of milk.

In the Listowel dairy record centre, when considering the comparatively large number of cows, 568, the average is one of the best in Ontario, namely, 6,379 pounds of milk and 213 pounds of fat. Several individual yields are over 9,000 pounds of milk and 300 pounds of fat. One of the best cows has 13,364 pounds of milk and 468 pounds of fat to her credit.

It is the more strange, therefore, that supplying the same factory are cows giving only 3,500 and 3,200 pounds of milk and 132 and 103 pounds of fat. One herd of 7 cows has an average of only 146 pounds of fat. Other herds of 7 and 10 cows average more than twice as much. One herd of 18 cows has an average of 9,696 pounds of milk and 324 pounds of fat.

In the Mallorytown dairy record centre are also to be found some strong contrasts. While there are many good yields there are also several poor records. In one herd of 14 cows where the average is 6,089 pounds of milk and 197 pounds of fat, the best yield is 8,330 pounds of milk and 315 pounds of fat, but there are also 2 yields of only 2,640 pounds of milk and 87 and only 76 pounds of fat.

One of the best herds has an average of 8,455 pounds of milk and 279 pounds of fat from 19 cows, the best cow giving 440 pounds of fat, *almost six times* as much as the poor cow noted just above.

Another herd of 11 cows gives an average of 289 pounds of fat.

At the North Gower dairy record centre is one group of 119 cows with an average of 5,804 pounds of milk and 203 pounds of fat. While there is an occasional poor aver-

age yield as, for instance, one of only 3,914 pounds of milk and 145 pounds of fat from 16 cows, there are also good herd averages of 233 and 256 pounds of fat.

Some good individual yields are over 10,000 pounds of milk and 342 pounds of fat.

At the Peterborough dairy record centre the variation at the separate branches is from 5,059 pounds of milk and 172 pounds of fat from 41 cows at Lang, up to 7,941 pounds of milk and 260 pounds of fat from 39 cows at Central Smith. If our factories could reckon on such an increase of 2,900 pounds of milk per cow there would be less need for worry over expenses. Cow-testing will speedily help towards this end.

Some of the best herd averages here are 7,682 pounds of milk and 243 pounds of fat from 12 cows, and 10,296 pounds of milk and 333 pounds of fat from 12 cows.

Two four-year-old pure-breds have records of over 19,100 pounds of milk and 556 pounds of fat.

A five-year-old grade has the poor yield of only 2,495 pounds of milk and 108 pounds of fat.

In several herds are contrasts of yields of milk and fat more than double that of others; in one herd is a yield of only 2,769 pounds of milk and 101 pounds of fat contrasted with 10,937 pounds of milk and 375 pounds of fat.

In one herd of 8 cows the lowest yield is 6,533 pounds of milk, and 5 cows average 12,965 pounds.

Close by in another herd is a four-year-old giving only 2,871 pounds of milk and 98 pounds of fat.

In the Perth dairy record centre the variation between branches is from 2,344 pounds of milk and 85 pounds of fat given by four cows at Middleville, up to 7,074 pounds of milk and 234 pounds of fat from 17 cows at Lanark. The 4 cows referred to are ages 12, 4, 8 and 5.

There are several poor heifers here giving less than 100 pounds of fat, which state of things might well cause some steps to be taken for better yields. Two four-year-olds in one herd give only 86 and 73 pounds of fat.

In one herd of 11 cows where the youngest is 5 years old the average is only 3,357 of milk, and 249 pounds of fat. There are few good individual yields of 8,000, 11,000 and 12,000 pounds of milk, and as high as 440 pounds of fat.

In another herd of 12 cows, including 2 three-year-olds the average is 7,642 pounds of milk, and as high as 249 pounds of fat. There are a few good individual yields of 8,000, 11,000 and 12,000 pounds of milk, and as high as 440 pounds of fat.

In the Woodstock dairy record centre there is the noteworthy average from 101 cows of 8,628 pounds of milk, 3·4 test, and 298 pounds of fat.

One herd of 19 cows averages 10,306 pounds of milk and 348 pounds of fat, including individuals giving 434 and 479 pounds of fat.

While in this centre there are a few records from mature cows of less than 4,000 pounds of milk and only 136 pounds of fat, we also have here an eight-year-old grade with the record of 19,585 pounds of milk and 701 pounds of fat, more than *five times as much.*

TABLE 3.—Average Yields of cows recorded for the Full Period of Lacation in the Province of Quebec, 1913.

Electoral District.	Name.	No. of Herds.	No. of Cows.	Average Yield.		
				Milk.	Test.	Fat.
	Dairy Record Centres.			Lb.		Lb.
Pontiac	Shawville	37	314	4,709	3·5	168·0
Dorchester	Ste. Henedine	24	153	3,547	3·9	139·9
St. Hyacinthe	St. Hyacinthe	50	485	4,742	4·0	191·5
Champlain	St. Prosper	46	441	4,513	3·8	174·8
Stanstead	Way's Mills	62	663	4,355	3·9	170·7
	Cow Testing Associations.					
Brome	Knowlton	2	34	4,938	4·4	219·3
Berthier	St. Damien de Brandon	1	10	3,355	4·1	140·3
Compton	Martin's Corners	5	76	5,024	4·4	227·0
Drummond and Arthabaska	St. Germain de Grantham	2	19	4,217	3·6	155·1
"	Drummondville	4	20	3,854	3·7	145·0
Kamouraska	St. Paschal	1	8	3,345	3·8	129·9
Lotbinière	Ste. Emelie	2	15	3,797	3·8	144·5
Missisquoi	Cowansville	5	74	5,527	3·9	220·6
"	Dairy Valley	1	7	4,810	3·6	176·5
Richmond	Richmond and Melbourne	3	35	5,766	3·9	225·0
Shefford	Waterloo	2	32	5,316	3·5	190·4
"	West Shefford	1	12	3,749	3·6	135·1
Stanstead	Hatley North	3	31	4,112	3·9	163·3
"	Kingscroft	5	56	3,844	3·7	144·8
General average for the Province		260	2,532	4,512	3·9	176·2

NOTE.—This table, and the similar table for each province should contain a great many more cows, but it does not because records were received of a great number of cows for only four or five months.

In the province of Quebec, though the general average yield per cow for 2,532 cows is 4,512 pounds of milk and 176 pounds of fat, the various districts in which testing was carried on by the Dairy Division offer strong contrasts. No fewer than sixteen districts have an average of less than 4,000 pounds of milk which affect considerably the good yields of milk and fat at Knowlton, Martin's Corners, Cowansville and Richmond.

In the Shawville dairy record centre some of the best herd average yields are 6 cows, 5,142 pounds of milk and 172 pounds of fat; 10 cows, 5,439 pounds of milk and 184 pounds of fat; 6 cows, 6,586 pounds of milk, and 216 pounds of fat.

These herds contain good individual cows giving as high as 6,597 pounds of milk and 225 pounds of fat; 9,063 pounds of milk and 219 pounds of fat and 10,875 pounds of milk and 394 pounds of fat.

In the Ste. Henedine dairy record centre two of the best herds are at St. Isidore, 9 cows, 4,418 pounds of milk and 172 pounds of fat; and St. Anselme, 13 cows, 4,296 pounds of milk and 167 pounds of fat.

The best individual yields are 5,125 pounds of milk and 201 pounds of fat; 6,960 pounds of milk and 236 pounds of fat.

In the St. Hyacinthe dairy record centre good yields of individual cows are: 7,055 pounds of milk and 280 pounds of fat; 7,070 pounds of milk and 323 pounds of

fat; 7,530 pounds of milk and 341 pounds of fat; 8,564 pounds of milk and 348 pounds of fat; 9,832 pounds of milk and 379 pounds of fat; 9,904 pounds of milk ad 383 pounds of fat.

One herd showing a good average is of interest as being one composed of cows with a particularly even production. The 12 cows average 4,988 pounds of milk and 197 pounds of fat. In this herd, with the exception of one young heifer, each cow produces over 4,400 pounds of milk.

One of the good herds is at St. Hyacinthe le Confesseur, where 9 cows average 7,816 pounds of milk and 287 pounds of fat.

Close by this is a herd of 7 cows with an average of only 2,763 pounds of milk and 113 pounds of fat, the highest individual yield being from a ten year old, 3,440 pounds of milk and 145 pounds of fat.

In the St. Prosper dairy record centre two of the best herd averages are: 18 cows 5,870 pounds of milk and 221 pounds of fat; 6 cows, 6,300 pounds of milk and 252 pounds of fat. These herds contain good individual cows giving as much as 8,150 pounds of milk and 274 pounds of fat; 8,305 pounds of milk and 313 pounds of fat and 8,447 pounds of milk and 343 pounds of fat.

In the Way's Mills dairy record centre there is a difference in the yield of 1,576 pounds of milk and 64 pounds of fat between the average of the 175 cows at Way's Mills and the average of the 63 cows at Barnston.

The herd averages run all the way from 101 to 296 pounds of fat. In the best herd of 10 cows each individual with the exception of one gives over 235 pounds of fat. The best cow gave 8,972 pounds of milk and 435 pounds of fat.

TABLE 4.—Average Yields of Cows recorded for the Full Period of Lactation in the Province of New Brunswick, 1913.

Electoral District.	Name.	Number of Herds.	Number of Cows.	Average Yield.		
				Milk.	Test.	Fat.
				Lb.		Lb.
	Dairy Record Centres.					
Kings and Albert	Sussex	40	502	4,650	4·0	188·2
Westmorland	St. Joseph	84	378	3,503	3·9	138·1
	Cow-Testing Associations.					
Kings and Albert	Hampton	4	54	5,066	3·9	196·9
	Kingston	2	7	3,871	4·3	169·1
Sunbury and Queen's	Welsford	5	33	5,445	3·8	207·2
Westmorland	Forest Glen	1	12	4,327	4·7	206·2
General average for the Province		136	986	4,250	4·0	170·2

NOTE.—This table, and the similar table for each province should contain a great many more cows, but it does not because records were received of a great number of cows for only four or five months.

Table No. 4 illustrates again very forcibly that wherever an "average" is given, inquiry may well step forward a pace or two. While the average for the 986 cows recorded in New Brunswick stands at 4,250 pounds of milk and 170 pounds of fat,

there are included in that average two such extremes as 150 cows with an average of only 2,878 pounds of milk, and 33 cows with an average of 207 pounds of fat.

Some of the individual cows at Hampton made good records of 251, 282 and 296 pounds of fat.

At the Sussex dairy record centre some good herds are: 16 cows with an average of 5,274 pounds of milk and 220 pounds of fat, including 4 cows giving over 250 pounds of fat, and one cow with 323 pounds; 13 cows averaging 6,842 pounds of milk and 286 pounds of fat, including 3 cows over 300 pounds of fat, and one giving 9,724 pounds of milk and 437 pounds of fat; 16 cows with an average of 6,730 pounds of milk and 259 pounds of fat.

In several herds are found good individual cows giving over 320 pounds of fat. Unfortunately there are also several mature cows giving less than 100 pounds of fat.

One of the best herds in the St. Joseph dairy record centre is that of 12 cows at Dorchester, with an average of 5,780 pounds of milk and 220 pounds of fat. The best cow gave 7,575 pounds of milk and 304 pounds of fat.

The general average yield for the province is lowered considerably by the poor yields in one or two sections. For instance at St. Louis the average for 150 cows is only 2,878 pounds of milk and 116·6 pounds of fat.

In the Sussex dairy record centre some of the good herd averages are: Norton, 13 cows 6,842 pounds of milk and 286 pounds of fat; at Sussex, 16 cows 6,730 pounds of milk and 259 pounds of fat; 11 cows 6,054 pounds of milk and 241 pounds of fat.

TABLE 5.—Average Yields of Cows recorded for the Full Period of Lactation in the Province of Nova Scotia, 1913.

Electoral District.	Name.	Number of Herds.	Number of Cows.	Average Yield.		
				Milk.	Test.	Fat.
	Dairy Record Centres.			Lb.		Lb.
Pictou	Scotsburn	42	225	4,623	4·3	198·0
	Cow-Testing Associations.					
Colchester	Brookfield	3	26	5,802	3·7	218·2
Kings	Kingston	1	13	7,409	4·3	325·5
Yarmouth	Yarmouth	6	34	5,691	4·9	283·5
General average for the Province		52	298	4,969	4·3	214·9

NOTE.—This table, and the similar table for each province should contain a great many more cows, but it does not because records were received of a great number of cows for only four or five months.

Though the general average yield for Nova Scotia is 4,969 pounds of milk and 214·9 pounds of fat for all the 298 cows, the figures in the respective localities show some great variations. For instance, the 26 cows at Brookfield average 1,789 pounds of milk and 59·8 pounds of fat more than the 18 cows at Malagash.

In the Scotsburn dairy record centre a good herd average is 6,520 pounds of milk and 234 pounds of fat from 14 cows. The best individual yield is 10,062 pounds of milk and 386 pounds of fat.

This one cow gave more milk and fat than several lots of *three cows* each in different herds in the same locality.

TABLE 6.—Average Yields of Cows recorded for the Full Period of Lactation in the Province of Prince Edward Island, 1913.

Electoral District.	Name.	Number of Herds.	Number of Cows.	Average Yield.		
				Milk.	Test.	Fat.
	Dairy Record Centres.			Lb.		Lb.
Prince	Kensington	36	256	4,976	3·8	190·9
	Cow-Testing Associations.					
Queen's	Crapaud	9	32	5,880	3·8	222·5
Queen's	Marshfield	12	79	5,724	4·1	233·0
General average for the Province		60	389	5,261	3·9	203·1

NOTE.—This table, and the similar table for each province should contain a great many more cows, but it does not because records were received of a great numbed of cows for only four or five months.

As in the other provinces, the differences in the averages of the several districts in Prince Edward Island show some strong contrasts, though all are included in the general average yield of 5,261 pounds of milk and 203 pounds of fat for 389 cows. For instance, the 23 cows at Kinkora gave, on the average, 1,635 pounds of milk and 32 pounds of fat *less* than the 22 cows at North Tryon.

In the Kensington dairy record centre some of the good herd averages are: 6,346 pounds of milk and 229 pounds of fat from 12 cows; 6,673 pounds of milk and 233 pounds of fat from 9 cows; 6,898 pounds of milk and 263 pounds of fat from 6 cows.

Such good records do not shine in the general average because their lustre is dimmed by the contrasted herd averages of only 3,796 pounds of milk and 143 pounds of fat from 9 cows, and 3,516 pounds of milk and 146 pounds of fat from 4 cows.

Some of the good yields from individual cows are 8,908 pounds of milk and 278 pounds of fat; 8,195 pounds of milk and 314 pounds of fat; 7,580 pounds of milk and 336 pounds of fat; 8,520 pounds of milk and 413 pounds of fat.

At Marshfield, though the average yield of 79 cows is 5,724 pounds of milk and 233 pounds of fat, two herds show a strong contrast.

One, with 9 cows, has an average of 8,498 pounds of milk and 303 pounds of fat, *more than twice as much* as from a herd of 4 cows which average only 3,766 pounds of milk and 144 pounds of fat.

While the average for the 256 cows recorded at the Kensington, P.E.I., dairy record centre for the full period of lactation is 4,976 pounds of milk, 3·8 test and 190·9 pounds of fat, the averages at the three branches show considerable variation.

The yield at Kinkora is 822 pounds of milk per cow less than at Kensington, and at Dunk River it is 37·2 pounds of fat per cow less.

Several herd yields stand out prominently, such as 12 cows with an average of 229·7 pounds of fat; 9 cows giving 233 pounds of fat; 14 cows, 239 pounds; so that those owners of herds down in the 160 and 140 pound classes may take fresh courage from the success of their neighbours.

Many of the individual yields are good, such as 8,195, 8,457 and 8,908 pounds of milk containing 277, 278 and 314 pounds of fat. Such records should help to show that cows giving only about 3,300 pounds of milk and 130 pounds of fat should be counted as decidedly out of date and out of place on a real dairy farm.

TABLE 7.—Summary of Average Monthly Yields, 1913.

Month and Province.	Total Number of Herds.	Total Number of Cows.	Average Yield.		
			Milk.	Test.	Fat.
			Lb.		Lb.
January—					
Nova Scotia	32	166	578	4.3	24.8
Prince Edward Island	20	71	670	3.6	24.0
New Brunswick	24	162	518	4.1	21.5
Ontario	182	1,055	551	3.6	20.1
Quebec	50	436	454	4.1	18.5
General average yield	308	1,890	533	3.8	20.4
" " weights only	29	150	573		
February—					
Nova Scotia	32	168	583	4.3	25.4
Ontario	187	902	702	3.5	24.8
Prince Edward Island	19	70	651	3.7	23.6
New Brunswick	25	163	567	4.1	23.3
Quebec	44	339	539	4.1	22.2
General average yield	307	1,642	641	3.8	24.2
" " weights only	26	112	625		
March—					
Prince Edward Island	25	103	753	3.6	27.4
Nova Scotia	33	169	631	4.3	26.9
Ontario	240	1,197	774	3.4	26.3
New Brunswick	28	189	585	4.1	24.1
Quebec	97	557	617	3.8	23.7
General average yield	423	2,215	707	3.6	25.6
" " weights only	49	187	696		
April—					
Prince Edward Island	26	116	704	3.8	26.5
Nova Scotia	48	248	596	4.4	26.0
Ontario	378	2,376	782	3.3	25.8
New Brunswick	53	426	588	4.0	23.4
Quebec	199	1,500	618	3.6	22.5
General average yield	704	4,666	701	3.5	24.6
" " weights only	81	486	772		
May—					
Ontario	580	4,918	881	3·3	29·3
Nova Scotia	50	289	612	4·3	26·3
Prince Edward Island	41	190	687	3·7	25·6
Quebec	306	2,698	683	3·7	25·3
New Brunswick	72	677	606	4·0	23.8
General average yield	1,049	8,772	786	3·5	27·5
" " weights only	36	295	808		

TABLE 7.—Summary of Average Monthly Yields, 1913.—*Continued.*

Month and Province.	Total Number of Herds.	Total Number of Cows.	Average Yield.		
			Milk.	Test.	Fat.
			Lb.		Lb.
June—					
Ontario	623	6,065	936	3·3	30·8
Prince Edward Island	70	390	774	3·7	29·1
Nova Scotia	74	460	663	4·3	28·6
Quebec	410	3,855	709	3·7	26·2
New Brunswick	179	1,221	614	3.8	23.5
General average yield	1,356	11,991	815	3·5	28·4
" " weights only	34	318	905		
July—					
Prince Edward Island	76	483	776	3·7	29·2
Ontario	625	6,269	808	3·3	26·5
Nova Scotia	73	476	607	4·2	25·4
Quebec	407	4,010	630	3·8	23·9
New Brunswick	185	1,260	570	3·8	21.9
General average yield	1,366	12,498	717	3.5	25·2
" " weights only	26	268	835		
August—					
Prince Edward Island	73	474	690	3·6	25·2
Ontario	603	6,117	682	3.4	23.3
Nova Scotia	61	387	551	4.2	23 3
Quebec	354	3,500	540	3.9	21.3
New Brunswick	165	1,119	510	4.0	20.1
General average yield	1,256	11,597	619	3.6	22.6
" " weights only	24	253	647		
September—					
Prince Edward Island	66	424	660	3.9	25.5
Ontario	578	5,872	658	3·6	23.8
Nova Scotia	57	341	498	4.4	21.9
Quebec	296	2,865	488	4.2	20.2
New Brunswick	152	1,018	439	4.2	18.4
General average yield	1,149	10,520	585	3.8	22.3
" " weights only	27	252	712		
October—					
Prince Edward Island	60	367	575	3·9	22·7
Ontario	535	5,309	550	3.9	21.0
Nova Scotia	77	341	456	4.5	20.3
Quebec	253	2,408	405	4.3	17.6
New Brunswick	120	765	376	4·4	16·8
General average yield	1,045	9,190	495	4.0	19.8
" " weights only	25	246	588		
November—					
Nova Scotia	86	346	454	4·5	20.3
Prince Edward Island	48	300	483	4.0	19.3
Ontario	401	3,602	444	3.8	17.0
New Brunswick	100	591	344	4.5	15.5
Quebec	191	1,753	326	4.4	14.4
General average yield	826	6,592	406	4.0	16.4
" " weights only	33	314	511		
December—					
Nova Scotia	72	280	447	4.6	20.5
Prince Edward Island	32	175	464	4.2	19.4
New Brunswick	80	445	398	4.3	17.3
Ontario	254	1,951	448	3.8	17·0
Quebec	111	940	335	4.3	14.5
General average yield	549	3,791	415	4.0	16.8
" " weights only	43	285	383		

This table is arranged by provinces with the highest yield of fat per cow given first of each month. Ontario has the lowest average test each month.

The total number of records of individual cows made during the year was 3,166 for weights only, and 85,364 for weights and tests, a total of 88,530.

PERCENTAGE OF FAT.

TABLE 8.—Average Percentage of Fat during the Year 1913, by Provinces.

Province.	Total Number of Tests.	Total Pounds of Milk.	Total Pounds of Fat.	Average Per Cent of Fat.
Ontario	45,633	32,512,343	1,124,025·1	3·45
Quebec	24,825	13,884,912	540,905·2	3·90
New Brunswick	8,036	4,105,043	165,279·8	4·02
Nova Scotia	3,671	2,040,978	88,571·7	4·34
Prince Edward Island	3,163	2,103,651	80,006·4	3·80

These average tests correspond very closely with those of the last two years.

During 1913 the number of cows tested each month in the Dominion varied from 1,642, in February, to 12,498, in July, with a total of 85,364 tests of individual cows for fat during the year, for which the average was 3·66 per cent of fat.

TABLE 9.—Average Percentage of Fat, by Months and Provinces, 1913.

Months.	Ontario.		Quebec.		New Brunswick.		Nova Scotia.		Prince Edward Island.		Total.	
	Number of Cows.	Average Test.	Number of Cows.	Average Test.	Number of Cows.	Average Test.	Number of Cows.	Average Test.	Number of Cows.	Average Test.	Number of Cows.	Average Test.
January	1,055	3·6	435	4·1	162	4 1	166	4·3	71	3·6	1,890	3·8
February	902	3·5	335	4·1	163	4·1	168	4·3	70	3·7	1,642	3·8
March	1,197	3·4	557	3·8	189	4·1	169	4·3	103	3·6	2,215	3·6
April	2,376	3·3	1,493	3·6	426	4·0	248	4·4	116	3·8	4,666	3·5
May	4,918	3·3	2,690	3·7	677	4·0	289	4·3	190	3·7	8,772	3·5
June	6,065	3·3	3,847	3·7	1,221	3·8	460	4·3	390	3·7	11,991	3·5
July	6,269	3·3	4,010	3·8	1,260	3·8	476	4·2	480	3·7	12,498	3·5
August	6,117	3·4	3,492	3·9	1,119	4·0	387	4·2	474	3·6	11,597	3·6
September	5,872	3·6	2,865	4·2	1,018	4·2	341	4·4	424	3·9	10,520	3·8
October	5,309	3·9	2,408	4·3	765	4·4	341	4·5	367	3·9	9,190	4·0
November	3,602	3·8	1,753	4·4	591	4·5	346	4·5	300	4·0	6,592	4·0
December	1,951	3·8	940	4·3	445	4·3	280	4·6	175	4·2	3,791	4·0

DAIRY CENSUS AT THE DAIRY RECORD CENTRES.

Following the general plan of previous years, each recorder took what may be termed a "dairy census" of herds in his district, a few details of which are presented below.

There are 7,659 cows in 724 herds in 21 centres reported on, as compared with 3,188 cows in 331 herds in 5 centres when this dairy record centre work was first undertaken in the year 1911.

Table 10.—Dairy Record Centres, 1913, Summary.

Dairy Record Centre.	Total Number of Herds.	Total Number of Cows.	Average Yield per Cow.	Average Yield per Acre cultivated including Pasture.	Average Number of Cows kept per 100 Acres.	Average Feed Cost of 100 lb. Milk.	Average Cash Receipts per Cow with Milk at $1 per 100 lb.	Estimated Cost of Feed per Cow.	Average Profit per Cow over cost of Feed.
			Lb. Milk.	Lb. Milk.		Cts.	$ cts.	$ cts.	$ cts.
Alexandria, Ont	13	186	4,422	519	11	79	44 22	34 82	9 40
Avonmore, Ont	12	171	4,949	746	15	70	49 49	34 77	14 72
Farmers' Union, Ont	52	528	5,572	525	9	66	55 72	37 15	18 57
Frankford, Ont	14	163	6,359	511	8	55	63 59	35 56	28 03
Kingston, Ont	10	171	5,763	617	10	72	57 63	41 60	16 03
Mallorytown, Ont	31	575	5,400	645	12	64	54 00	35 07	18 93
Perth, Ont	5	50	4,943	377	8	60	49 43	29 82	19 61
Peterboro', Ont	39	359	5,781	341	6	70	57 81	40 87	16 94
North Gower, Ont	17	184	5,381	537	10	57	53 81	31 13	22 68
Listowel, Ont	83	975	5,349	614	11	76	53 49	40 76	12 73
Woodstock, Ont	32	445	6,728	837	12	66	67 28	44 83	22 45
Totals and averages for Ontario	308	3,807	5,619	570	10	68	56 19	38 54	17 65
Shawville, Que	18	190	4,461	426	9	60	44 61	26 66	17 94
St. George, Que	15	125	3,201	237	8	80	32 01	25 67	6 34
St. Henedine, Que	35	290	3,500	306	9	87	35 00	30 43	4 57
St. Hyacinthe, Que	100	950	4,363	341	8	75	43 63	33 05	10 55
St. Prosper Que	45	478	4,372	397	9	74	43 72	32 43	11 29
Way's Mills, Que	48	670	*161	397	9	92	48 30	37 08	11 22
Totals and averages for Quebec	261	2,703	4,152	358	9	80	41 52	32 87	8 65
St. Joseph, N.B	71	322	3,535	218	6	86	35 35	30 27	5 08
Sussex, N.B	33	447	*192	490	10	97	57 60	46 78	10 82
Scotsburn, N.S	20	135	*214	372	7	105	64 20	52 53	11 67
Kensington, P.E.I	31	245	4,729	327	7	62	47 29	29 62	17 67
Totals and averages for the Maritime Provinces	155	1,149	4,451	342	8	88	49 94	39 17	10 77

* As Way's Mills, Que., Scotsburn, N.S., and Sussex, N.B., are creamery sections, the yield per cow is taken in pounds of fat, valued at 30 cents per pound.

Mr. Freeman Brown, recorder at the Farmers' Union, Ont., dairy record centre in sending in the following interesting notes, states:—

"One thing that should encourage men to take up cow-testing is that it will show to them that they are spending more time in looking after cows that do not pay for their keep than would pay many times over for the little time spent in weighing and sampling.

"I am trying to get some of the men in my district to see not only the great benefit of a pure-bred sire, but to note how much energy the cows are losing at their expense by trying to digest an occasional extra amount of feed which is not suitable, not being succulent or forming a well balanced ration.

"Cow-testing helps to improve in different ways. Several men that take an interest in the test find that it pays to care for the cows better. They have made great improvements by getting more light, air and whitewash in the stables, and by brushing the cows."

THE PROFIT FROM A GOOD COW.

A grade cow at Oxford Mills earned $100.15 from the factory for 9,245 pounds of milk from June 26 to December 4. The milk used at home was 4,520 pounds, worth $49.60, total value of milk $149.75. Her feed cost $63.93, leaving $85.62 clear profit.

A neighbour with 8 cows sent only 23,157 pounds to the factory, receiving $239.48. Outside the factory season the 8 cows gave 5,555 pounds worth $57.87, total value $297.35. Deducting feed estimated at $29.50 per cow, or $236, the clear profit is $61.35, or only $7.66 per cow.

Thus the first good cow mentioned made as much clear profit above the cost of feed as would be made by *eleven* of the type of the herd of 8.

There was also a considerable saving of time and labour.

WHAT SOME DAIRYMEN HAVE TO SAY ABOUT COW-TESTING.

"Cow-testing showed me how to feed intelligently; one cow would not respond to any extra feed, while another took much more and gave a good profit."

"I was surprised to find that one cow gave me $15.12 in the year more than another of the same age that freshened just four days different."

"One cow cost me $2.55 more to feed than she earned."

"I was astonished to find one cow gave 1,145 pounds of milk more than another that freshened a month earlier."

"I did not think I had such poor cows till I commenced to weigh each one separately."

"I find it pays to test as well as weigh the milk; one cow gave me 568 pounds of milk more than another, but 16 pounds of fat less. One cow gave me 45 pounds of fat more than another the same age."

"I found that my two best cows, age 5, gave me 799 pounds of milk more than three others also age 5. Seeing they were all fed alike, I had to handle 5 poor cows to get the profit made by one good cow. This looks like waste of time."

One farmer at Spencerville, Ont., states that cow-testing has done more for the upbuilding of dairying and for increasing the profit per cow than anyone would think possible.

Another large milk shipper in this district says he finds it pays him to feed each cow according to her yield, instead of lumping all together and feeding all just alike.

"I consider the scales and tester to be the greatest aid. The scales act as governor to regulate your care and feed by, and in this way alone I had added 500 pounds of milk to each of my cows' production. I weigh every milking of every cow; it pays big."—(Boharm, Sask.)

"We have weighed each milking for four years and have made the following averages: 1910, 19 cows, 7,240 pounds of milk; 1911, 21 cows, 7,450; 1912, 23 cows, 7,319; 1913, 25 cows, 8,000 pounds. *We now sell all cows that do not make 7,000 lbs., and all two-year-olds that go under 6,000 lbs.* We also find that a cow that freshens in November or December gives from two to three thousand pounds more than one that freshens in April or May."—(Lansdowne, Ont.)

"The more we follow up weighing and testing of each cow's milk, the more we are convinced that it is the only way to show what our cows are doing. We thought the weighing night and morning might become tedious, but it is just the opposite."—(Clarenceville, Que.)

One of the interesting points at Farmers' Union is that the three highest yields of milk per acre, namely 1,108, 1,114 and 1,219 pounds were made on a comparatively small area, the largest farm concerned being 85 acres. On this place 12 grade cows were kept with an average yield of 7,893 pounds of milk each.

On another farm in this centre of 90 acres carrying nine cows averaging 7,899 pounds of milk, the cost of feed was put at $40 and the clear profit above cost of feed was just the same figure, $40. The milk was produced at 50 cents per 100 pounds.

One man keeping 8 cows farmed only forty acres and made a profit of $25.55 per cow. A neighbour, also with 8 cows, has 175 acres of land and made a profit of $9.86 per cow.

In the two largest herds, one man with 17 cows averaged 4,446 pounds of milk; the other with 19 cows averaged 6,534 pounds of milk. The 19 cows made almost *three times as much* clear profit over cost of feed.

The lowest yield of milk per acre was 184 pounds from 4 cows on 100 acres; the highest was 1,219 pounds from 8 grades on 40 acres, over *six times as much* per acre.

It will be noticed from table 11 that in the five poorest herds the average yield per cow was 3,883 pounds of milk. In order to yield the total milk given by all the 42 cows it would only have needed 20 cows, instead of 42 of the kind that averaged 8,033 pounds each. What energy is wasted!

Mr. J. B. Lowery, recorder at the Frankford dairy record centre, draws attention to some wonderful differences between cows in the same herd. For instance, a seven-year-old freshened April 3, gave, in four months, 5,073 pounds of milk and 193 pounds of fat, while a six-year-old freshened April 4, gave in the same four months only 3,672 pounds of milk and 133 pounds of fat. This is a difference of 1,401 pounds of milk and 60 pounds of fat.

The weigh can at the factory never reveals these differences. They can be detected only by the farmer himself in his own stable.

One of the features of the production at this centre is the low cost of milk. Men give $27.25 and $28.47 as the cost of feed, so with cows giving 5,000 and 6,000 pounds of milk the cost per 100 is as low as 45 and 43 cents.

The differences in average yields of herds in this centre are suggestive. At Acme the average of 27 cows is 8,314 pounds of milk and 269 pounds of fat. At Frankford the average of 26 cows is only 5,424 pounds of milk, and 191 pounds of fat, a monetary value of at least $28 per cow *difference* in income during the season.

Mr. Wm. Weir, recorder at Peterborough, states that a number of cows in that dairy record centre have been disposed of through the information received by weigh-

ing and sampling. One man let seven go. Another dairyman who intended to let a cow go thought he would test her, and at the age of 15 her milk sold for $199 at four cents per quart.

Mr. J. C. Raphael, recorder at Mallorytown, has the following statement from one member: "We have increased our milk flow and cash returns over 33 per cent in three years. This weighing and sampling is the only method of ascertaining the profit or loss on each cow, and how much. From a business standpoint it is compulsory."

Mr. F. J. Wilkinson, recorder at the Way's Mills, Que., dairy record centre, makes a valuable contribution to the arguments in favour of feeding well and knowing what is fed, in the following experience of a member in his district: "It is quite a common practice among the farmers to allow their cows to dry off as soon as they come to the barn in the fall. They say: 'Oh, it does not pay to feed strippers; there is no profit in it.' Now, this is just the way the owner of this herd felt. But last summer he started cow-testing and soon got very much interested in getting his reports each month. He fed a little better through the fall months, as he did not like to see his reports show too much of a decrease, and when the cows came to the barn he kept right on feeding better, and here is the result. He had 14 cows. During the three months from January 1 to March 31 he fed them $88.75 worth of meal and $47.32 worth of roots, and during that time those cows produced 986 pounds of butter fat for which he received $235.24, leaving him a net profit of $199.17. He considers this net profit, as what hay and straw they consumed he would have had to feed them if they had been dry. I might say I saw this herd the other day and I actually believe they are in enough better condition to pay for the extra feed they consumed even if they had not produced anything. Now this man never would have thought of doing this if he had not started cow-testing. The idea is that he got interested in what his herd was doing and wanted to see them do better. And this is just what cow-testing does every time. When a man goes into it in the right spirit it gives him an interest in his herd."

Mr. Wilkinson also states that there is an increasing interest in dairying as a whole. Men who never thought of cow-testing before are now buying hand Babcock machines to do their own testing.

At Way's Mills the 49 cows in the five best herds in table 11 produced 3,185 pounds of fat *more* than did the 64 cows in the five poorest herds. This fat at 30 cents per pound brought in an *additional income* to the amount of $955.50.

Mr. Wilkinson reports that no fewer than ten pure-bred dairy sires have been brought into that centre during the past year.

TABLE 11.—Comparison of the 5 herds showing the HIGHEST average yield of Milk per Cow with the 5 herds showing the LOWEST average yield in each Dairy Record Centre.

	5 Best Herds.		5 Poorest Herds.		Difference in Average Yield per Cows.
	Number of Cows.	Average Yield	Number of Cows.	Average Yield	
		Lb. Milk.		Lb. Milk.	Lb. Milk.
Alexandria	54	5,503	81	4,016	1,487
Avonmore	61	5,672	83	4,469	1,203
Farmers' Union	56	8,033	42	3,883	4,150
Frankford	45	7,600	49	5,516	2,084
Kingston	77	6,852	94	5,084	1,768
Mallorytown	112	7,212	74	3,703	3,507
North Gower	56	6,154	56	4,492	1,662
Peterboro	43	7,811	40	4,341	3,470
Listowel	60	9,053	59	3,466	5,587
Woodstock	83	10,445	55	4,055	6,390
Average for Ontario	647	7,482	633	4,318	3,164
Shawville	47	5,338	57	3,551	1,787
St. George	31	3,990	56	2,700	1,290
Ste. Henedine	34	5,219	56	2,526	2,693
St. Hyacinthe	83	6,469	42	3,052	3,417
St. Prosper	48	5,908	36	2,938	2,970
Way's Mills	49	5,575	64	3,000	2,575
Average for Quebec	292	5,636	311	2,960	2,676
St. Joseph	31	5,600	29	2,076	3,524
Sussex	66	6,350	71	3,375	2,975
Scotsburn	34	7,075	40	3,650	3,425
Kensington	37	6,508	44	3,502	3,006
Average for the Maritime Provinces	168	6,333	184	3,267	3,126

This table brings out some noteworthy points.

1. Even in taking average yields of comparatively large districts, the variations seen when comparing similar yields are curious. For instance, the average yield in the 5 best herds at Alexandria is 5,503 pounds of milk per cow, but at Woodstock it is 10,445 pounds. The difference of 4,942 pounds is surprising.

2. The larger yields are not being made by just a few prime cows but by *good herds,* as large as those composed of poor cows, herds where yields are uniformly good and where even better results are being zealously sought.

3. While the average difference in Ontario between the best and the poorest yields of all the 100 herds is 3,164 pounds of milk per cow, the two extremes are far wider apart; the average of the 5 best herds at Woodstock is more than the average of the 5 poor herds at Listowel by 6,979 pounds.

4. From this table it is evident that there is the strongest possible encouragement for every dairy farmer whose yield per cow is at present only medium, or below the average, to strive for better results. The point is that far better results are now being obtained in his own vicinity not by one or two exceptionally good individual cows of phenomenal breeding and ability, but by each one of the cows in five neighbouring herds.

5. The difference in income between these two sets of cows is too striking to be overlooked. If the 633 cows in the poor Ontario herds had been as good producers as those in the good herds, the *additional* revenue from their milk would have been *twenty thousand dollars.*

CONTRASTS AT ST. HYACINTHE, QUEBEC.

In a herd at St. Hyacinthe, Que., 1 five-year-old cow gave 7,407 pounds of milk and 267 pounds of fat, while another five-year-old fell short of that record by 3,462 pounds of milk and 103 pounds of fat.

Without cow-testing the owner of these two cows would have had no means of discovering that one cow brought in $38 more than the other.

In a herd at Grand Rang there is a difference in yield of 3,010 pounds of milk between 2 three-year-olds.

In a herd at Notre Dame a three-year-old gave 1,324 pounds of milk more than an eight-year-old.

In a herd at Ste. Rosalie a six-year-old gave 3,450 pounds of milk more than a five-year-old on the same feed.

Mr. A. Hamel, recorder at St. Hyacinthe, states that following the system of testing, one factory is changing from the pooling system to payment for milk by fat. There is also a fast-growing sentiment in favour of better sires, so that the present year will probably see some good pure-breds brought into the district.

A STRONG ARGUMENT IN FAVOUR OF COW-TESTING.

It is only when dairy records are available that comparisons can be made which show not only the value of cow-testing, but the unnecessary labour and general loss involved in caring for poor cows.

For instance, one might take 500 cows in any one of several districts and ascertain that the average value of their milk is $47, the cost of feed $32, the profit $15.

But on closer scrutiny of milk records, such comparisons as the following are possible. Referring particularly to St. Prosper, Que., the 100 best cows in 14 herds had an average yield of 6,798 pounds of milk, but the 100 poorest cows yielded only 3,048 pounds, indicating a *difference* of 3,750 pounds of milk in the average yield per cow.

This means that practically *twice as much* labour, feed, stable accommodation, &c., have to be provided as is necessary. This is terrible waste.

But carrying on the comparison another step, it appears that the 100 best cows brought in a gross income of $7,137.90 which is actually $3,937.50 more than the 100 poorest, whose milk was worth only $3,200.40. If this is true in comparing just a few cows in one district, does it not indicate what a huge sum is available for any county or province when the herds are composed of the best cows, selected on their records, and their progeny?

But further, on an expenditure of $38.42 for feed the best cows made an average profit of $32.96; on the other hand the poorest cows returned an average profit of only $1.74 above the cost of feed.

In other words, to make as much profit as was returned by each one of the best cows, it took, of the poorest, the combined efforts of *eighteen.*

This certainly is an indication of most serious waste of energy spread over several herds, but it also indicates selected cows in their true light as both money and profit makers.

TABLE 12.—Some contrasts at the St. Prosper, Que., Dairy Record Centre.

Taking the 422 cows in 42 herds the general results were:—

Average yield of milk per cow, 4,494 pounds at $1.05	$47 18
Cost of feed	32 90
Net profit per cow	$14 28

But on separating the best and poorest cows, the items were:—

—	Best Cows.	Poorest Cows.	Difference.
Number of Cows	100	100	
Average yield of milk per cow	6,798 Lb.	3,048 Lb.	3,750 Lb.
Total value at $1.05	$ 7,137 90	$ 3,200 40	$ 3,937 50
Cost of feed	3,842 00	3,026 00	816 00
Total net profit	$ 3,295 90	$ 174 40	$ 3,121 50
Average income per cow	$ 71 38	$ 32 00	$ 39 38
Cost of feed	38 42	30 26	8 16
Average net profit above cost of feed	$ 32 96	$ 1 74	$ 31 21

From these figures it will be seen:—

(1) An "average" of a herd, or of a number of herds, seldom, if ever, gives due credit to good cows. Consequently, it must at the same time unduly enhance the supposed value of poor cows.

(2) From the feed to the extra value of $816 given to the best cows there was an additional clear profit of $3,121.50.

(3) The difference in the gross income is remarkable. The 100 best cows brought in far more than twice as much as the 100 poorest. The actual difference from the same number of cows was an additional $3,937.50.

(4) While the average profit with all the 422 cows was $14.28 per cow, it will be seen from the lower half of the table that the 100 best cows made an average profit of $32.96, but the 100 poorest gave an average profit of only $1.74 per cow. Thus, it is seen that the profit made by each one of the "best" cows was equal to that of *eighteen* of the "poorest."

It pays to keep good cows.

It pays to find out the difference between cows by keeping dairy records.

PURE-BRED SIRES.

It is a singular fact that out of the hundreds of herds tabulated it is the rare exception to find any pure-bred sire that is four years old; the ruling age seems to be one or two. As this is by no means the first time that this has been noticed, it would seem to be high time to lay special emphasis again on this point; probably *many excellent bulls are killed before their real value is known.* In other dairy countries it is common to find dairy sires aged ten and twelve, or even older. With any real system of selection and settled policy in building up a good herd, special value must be placed on the sire. A bright lookout may well be kept for the sire to be depended

on for heavy milking progeny. When his get is found to be doing well it has happened many a time that the sire has been killed, at a most distinct loss to the dairy world. Several of such sires would each be worth hundreds of dollars as individuals, and would have added thousands of dollars revenue to dairymen.

There are also many herds where apparently no continuity of ideas or policy is followed. The sire in use, for instance, is a one-year-old grade Holstein, but the cows are described as grade Shorthorns, the year before they were simply grades. In other herds there is a mixture of grades of three and four breeds, with a sire of another breed as head of the herd. The particular wisdom shown in crossing breeds to this extent has yet to be proved.

Is it not about time to stop this constant chopping and changing, and stick to the one breed best suited to the locality?

TABLE 13.—Showing the value of a Pure-bred Dairy Sire. Contrast at Farmers' Union, Ont., Dairy Record Centre.

—	Number of Herds.	Number of Cows.	Total Lb. Milk.	Average Lb. Milk Per Cow.
Group 1, Pure-Bred sire	7	83	655,801	7,901
Group 2, Grade sire	7	84	395,873	4,712
DIFFERENCE in favour of Pure-Bred sire.			259,928	3,189

This table indicates:—

1. Even with one cow less, the first group of 83 cows, where the herds were headed by a pure-bred sire, gave 259,928 pounds of milk *more* than the second group.

2. The difference in production per cow was 3,189 pounds of milk, which if divided amongst the 7 owners meant a total of $2,646.87, or $378.12 additional money for each man.

Mr. A. J. Gaudet, recorder at the St. Joseph, N.B., dairy record centre, instances the case of a cow bought at a very high price on account of her good conformation and the colour of her milk. She gave only 3,320 pounds of milk.

Another cow, sold because thought to be the poorest in the herd, gave 4,899 pounds of milk, while the poorest cow gave only 3,020 pounds.

Some breeders have rather prejudiced the sale of pure-bred sires because they have placed, at good prices, bulls that, though highly recommended, have proved quite unsatisfactory. The demand for milk records of the dam and granddam should be made just as well as for the certificate of registration.

In various herds in this centre also are curious contrasts in yields: An eight-year-old gave 5,920 pounds of milk and 227 pounds of fat, being 3,595 pounds of milk and 126 pounds of fat more than a six-year-old; 1,585 pounds of milk from a cow 11 years old and only 2,422 from a six-year-old; $33.82 from one cow, only $4.09 from another; 188 pounds of fat from one, only 97 from another.

TABLE 14.—Contrasts between the average yields of the Ten Best and the Ten Poorest Cows, 4 years old and upwards, in the St. Joseph, N.B., Dairy Record Centre.

Division.	Average of the 10 *Best* Cows.		Average of the 10 *Poorest* Cows.		Difference.		*Difference* between the Best and Poorest Individual Cow in the Division.
	Lb. Milk.	Lb. Fat.	Lb. Milk.	Lb. Fat.	Lb. Milk.	Lb. Fat.	Lb. Milk.
Bathurst	6,293	220.9	2,818	107·1	3,475	113.8	6,195
Dorchester	6,715	272.1	2,221	91·1	4,494	181.0	5,986
Rogersville	4,692	174.5	2,126	102·2	2,566	72.3	3,964
St. Louis	4,342	164·0	1,895	72·7	2,447	91.3	4,858

This table clearly indicates some of the discoveries made by cow-testing in almost every district.

Besides drawing attention to the extraordinary differences in production found not only between individual cows in the same herd, even as much as 6,195 pounds of milk as at Bathurst, but between the best and poorest groups of 10 cows in each division, the table points also to the great possibilities for the progressive dairyman. Here there is indeed "plenty of room at the top."

No man, or group of men, should be content with keeping mature cows giving only 2,220 pounds of milk as at Dorchester, Rogersville and St. Louis, when in the same locality yields of many cows are over 6,290 pounds, two and even *three times* as much.

VARIATION IN FEED COST OF MILK PER 100 POUNDS.

Not the least striking figures collected in the dairy census are those relative to the feed cost of milk.

It is patent that there is more than one contributory factor. The cows may not be naturally either heavy or economical producers, feed may be scarce, unsuitable combinations of feed may be used, or there may not be sufficient attention paid either to liberal feeding or to feeding according to each cow's production. All of these, among other conditions, may help to increase the cost.

It remains to be stated, however, that even where conditions do not vary to any large extent the difference in the cost of milk, as given for each herd in the various dairy record centres, is so remarkable in its variation that there is evidently most urgent need for our ordinary factory patron to pay far more attention to this most vital point.

Knowing that the factory price for milk is not likely to vary very much or to soar very high, he may well inquire closely what his milk costs to produce.

It is a fact that in many districts milk and fat cost some men half as much again, sometimes twice as much, even *more than three times* the price at which their neighbours produce it.

For instance, at Frankford, Ont., one herd averaging 7,231 pounds of milk per cow, the feed cost is only *43 cents* per 100 pounds. At the same factory for another herd averaging 6,252 pounds of milk per cow the feed cost is *78 cents* per 100 pounds.

At Mallorytown, Ont., the cost varies from 47 cents up to $1.01 per 100.

At Listowel, Ont., the figures are from 50 cents to $1.02 per 100.

At Alexandria, Ont., they run from *50 cents to $1.29* per 100.

At Peterborough, Ont., is an extreme instance. One herd averages 7,000 pounds of milk at a feed cost of $27 per cow, the milk therefore costing 39 cents per 100. In a

neighbouring herd feed to the value of $40.83 is given per cow to produce only 3,124 pounds of milk. This milk therefore costs $1.30 per 100 pounds, or *over three and a third times* as much. It would be rare to find raw material costing such widely different prices in other manufacturing industries.

Evidently there is plenty of room for planning more efficient work on the part of some dairymen. The cow will jog along without reference to dollars and cents. It is the owner's business to figure on cost and production.

Mr. Alfred Street, recorder at the Avonmore, Ont., dairy record centre, writes as follows:—

> "Farmers feel that it is not always wise to dispose of an animal as the result of the first year's records, as some cows are like some varieties of apple trees, producing a much larger quantity every second year.
>
> "After carefully studying for two years the herd record work in this record centre I have come to the conclusion that the weakest point with those who are keeping records (and with those as well who are not) is their method or lack of method of feeding. Some herds are fed quite liberally but not the proper kinds of feed to produce a maximum flow of milk. They do not seem to realize that quantity of feed will not take the place of quality. In a herd consisting of 7 or 8 pure-bred Ayrshires and seven or eight grades, the ration that was fed to the milking cows during the month of March was 20 pounds of corn silage, and 16 pounds of timothy hay and 1 pound of meal per day. The meal consisted of ground corn, oats and barley. The roughage you will notice is very low in protein and the meal also is comparatively low in protein. In fact, where it is figured out for protein and carbohydrates and fat it shows ·5 pound of the former and 9·3 pounds of the latter, showing it to be a decidedly unbalanced ration as the nutritive ratio is 1:17. The standard being from 1:5 to 1:6 shows that the above ration is about three times too wide. A milking cow giving from 20 to 25 pounds milk per day requires at the least from 2 to 2½ pounds of protein in her feed per day, while the above cows received only ½ pound. Of course there are farmers in this district who feed a better ration than the above, but it is fairly typical of the way the average farmer feeds his milking cows. Now is it any wonder that cows do not milk very well on such feed as the above? The man who is keeping records is not warranted in condemning his cows for making small records when fed in a manner such as the above.
>
> "Another striking thing about the above ration is this: The man brought the above meal and paid $1.40 per hundred pounds for it. He could have bought bran, gluten feed and oat chop for practically the same price, and it would have made ever so much a better meal ration for milk production when feeding roughage so low in protein as he was feeding. From my experience I have come to the conclusion that there is a danger of many cows being condemned by their owners without being given a fair test under proper feed and care."

At Peterborough is a herd of 6 cows whose owner states that they were fed at an average cost of $35.63. As they gave 8,788 pounds of milk the average profit above cost of feed is $52.25.

TABLE 15.—Some Individual Yields, and Averages of Four Neighbouring Herds, St. Hyacinthe, Que.

Cow.	Age.	Total Yield.		Cost of Feed.	Cost of 100 lb. of Milk.	Cost of 1 lb. of Fat.
		Milk.	Fat.			
		Lb.	Lb.	$	$ cts.	Cents.
1	6	6,066	222	32 00	0 52	14
2	6	3,845	153	32 00	0 83	20
3	3	2,891	125	32 00	1 10	25
Average of herd A		3,968	161	32 00	0 80	19
4	7	9,283	339	51 00	0 55	15
5	6	6,250	268	41 00	0 65	15
6	10	5,215	217	39 00	0 76	18
Average of herd B		6,808	263	42 00	0 64	15
7	5	4,430	166	31 00	0 70	18
8	5	3,348	135	31 00	0 93	22
9	6	2,850	102	31 00	1 09	30
Average of herd C		3,419	134	31 00	0 91	23
10	8	4,340	177	28 00	0 65	16
11	3	3,560	144	28 00	0 79	19
12	4	1,940	80	28 00	1 46	35
Average of herd D		3,566	144	28 00	0 79	19

This table is prepared to show:—

(1) The difference in cost of milk per 100 pounds between individual cows. For instance, cow No. 1 in herd A produced milk at *52 cents;* cow No. 2 in the same herd, also 6 years old, produced it at 83 cents; but the milk given by cow No. 12 cost $1.46.

(2) The difference in cost of milk in different herds. In herd B the average cost was only 64 cents; in herd C it was 91 cents.

(3) The benefit of liberal feeding of good cows. In herd B the average cost of feed was $43.00 per cow, running as high as $51.00 for one cow, but as the cows were good producers, the milk and fat were produced at a low cost, thereby ensuring good profit.

TABLE 16.—High and Low Cost of Feed per cow compared with Yield of Milk. Contrasts of Herds at Dairy Record Centres.

CENTRE.	HIGH COST OF FEED.			LOW COST OF FEED.		
	Number of Cows in Herd.	Average Cost of Feed.	Average Yield of Milk.	Number of Cows in Herd.	Average Cost of Feed.	Average Yield of Milk.
		$ cts.	Lb.		$ cts.	Lb.
Avonmore, Ont	14	44 00	6,157	15	31 50	4,234
Alexandria, "	10	41 88	6,590	10	25 50	3,670
Farmers' Union, "	15	50 50	8,591	9	29 50	3,590
Frankford, "	7	54 21	9,119	8	25 00	5,889
Kingston, "	13	51 15	6,325	19	31 92	4,732
Listowel, "	18	60 47	9,399	10	30 45	3,027
Mallorytown, "	25	45 00	8,280	13	27 30	3,938
North Gower, "	8	39 70	6,293	14	28 90	4,797
Peterborough, "	5	58 18	6,738	11	34 63	4,305
Woodstock "	18	57 00	9,843	8	34 20	3,420
Totals and averages	133	50 25	8,003	117	30 07	4,167
Ste. Henedine, Que.	5	36 53	5,020	11	22 70	2,323
St. Hyacinthe, "	7	43 75	6,806	10	26 00	3,290
St. Prosper, "	10	42 26	6,367	6	24 16	2,344
Way's Mills, "	10	70 00	9,120	14	31 00	3,390
Sussex, N.B	14	72 03	8,070	16	34 97	2,310
St. Joseph, N.B	12	45 35	5,780	5	24 66	2,264
Scotsburn, N.S	6	63 42	7,450	11	36 50	3,984
Kensington, P.E.I	12	46 01	6,380	6	21 23	2,702
Totals and averages	76	53 90	7,699	79	29 10	2,896

From this table it is seen:—

(1) That in Ontario, with 133 cows at ten centres, an average investment of $50.25 in feed resulted in an average yield of 8,003 pounds of milk, the milk therefore costing 62 cents per 100 pounds for feed.

(2) That at the same places, on the other hand, where the feeding was on a cheaper scale, averaging only $30.07 per cow for 117 cows, the average yield of milk was only 4,167 pounds, *scarcely more than half as much*, while the feed cost was 72 cents per 100 pounds, that is, ten cents more.

(3) That in Quebec and the Maritime Provinces, similarly, the yield of milk is higher where the cost of feed is greater. With 79 cows the feed cost of milk was $1.00 per 100.

(4) That amongst the herds with the low yields and low cost of feed per cow there is apparently a waste of feed, as some herds do not appear to pay for their feed; on the other hand, in every case where the cost of feed is high, the yield of milk is also high.

(5) That in the Ontario herds, those cows fed at a high cost show a profit on their milk over the cost of feed of 59 per cent. This is *21 per cent more* than those cows fed at a low cost where the average profit over cost of feed is only 38 per cent.

It is from such records and contrasts as these that the greatest encouragement is derived, because not only is there considerable satisfaction from noting the high individual and average yields of milk, even with feed costing $63 and $72 per cow, but the table also shows very clearly that *it pays to feed liberally*.

DIFFERENCE IN PROFIT RECEIVED.

In one Quebec centre are two herds of 13 cows each on adjoining farms. The average yield in one case was 190·4 pounds of fat per cow which, at 30 cents per pound, means an average income per cow of $57.12. Feed was worth $35 per cow, so the average net profit per cow above the cost of feed was $22.12. Just the other side of the line fence the neighbour's 13 cows averaged 92·4 pounds of fat, or an income of only $27.72 per cow. He said feed was worth $30, so it looks like a vanished profit, a loss of $2.28 per cow.

In another herd in the same centre at Way's Mills the average yield of 19 cows was 4,418 pounds of milk and 176 pounds of fat, which until further examined looks pretty good. However, the 10 best cows gave an average of 236·3 pounds of fat, worth $70.89; deducting the average price of feed, $30, the profit was $40.89 per cow. The remaining 9 cows in the herd averaged only 109 pounds of fat, worth $32.73. As their feed averaged the same as the other 10, namely $30, the clear profit was only $2.73. Thus the 10 cows in this herd made *fifteen times as much profit* as did the nine.

In the Sussex, N.B., dairy record centre the average feed cost of 100 pounds of milk varies from 69 cents to $1.43. The average feed cost of 1 pound of fat varies from 18 to 37 cents.

The yield of milk per cow varies from an average of 2,900 pounds in one herd of 9 to 6,834 pounds in a herd of 17.

In contrast to the particularly low estimates of cost of feed at Shawville, Que., the cost of feed at Sussex is put by some men at $58.10, $66.39 and even as high as $72.03 per cow.

One recorder states that judging by the look and condition of some of the cheaply fed herds in the spring, the total cost of feed in some instances has not been overestimated. As a consequence of this attempt at economy some cows are not worth twenty dollars, little scrubby things hardly fit to be seen.

INCREASES IN YIELD OF MILK AND FAT.

It is a matter of great satisfaction that so many dairymen have already reaped a substantial harvest of results from their brief experience with systematic cow-testing. Not only are the homes, the farms, the buildings, improved, but broad foundations are laid for further developments. With proof before their eyes that cow-testing is decidedly "worth while," steps are taken for provision of more variety in the rations through better crops, for better herds through the introduction of good pure-bred sires, and for a more liberal support of the factory from the same number of acres and cows as before.

It is evident that when the average is increased, as at Mallorytown, in two years from 5,700 to 7,650 pounds of milk per cow, or a good 33 per cent, that cow-testing means a great deal to that farmer and his family.

At Avonmore some good increases are 1,038 and 1,757 pounds per cow, results achieved by six men.

At the Listowel dairy record centre there are twenty-eight dairymen who have made considerable increases in the yield per cow. Comparing the year 1912 with 1913 the increase has been 738 pounds of milk and 38 pounds of fat with 774 cows. Many of the herds have increased over 1,000 pounds of milk. Some of the largest increases are: 10 cows now giving 8,294 pounds of milk and 272 pounds of fat, an increase of 1,225 pounds of milk and 32 pounds of fat per cow; 10 cows now giving 5,901 pounds of milk and 225 pounds of fat, an increase of 1,988 pounds of milk and 85 pounds of fat per cow; 8 cows now giving 6,226 pounds of milk and 253 pounds of fat, *an increase of 2,445 pounds of milk* and 126 pounds of fat per cow.

It is impossible to lay too much stress on the new inspiration given to many a man who has been struggling along with "just cows" giving about 3,500 pounds of milk, but who is now seized with the idea of the 10,000-pound mark, or higher.

That is what cow-testing accomplishes.

In the Peterborough, Ont., district are over twenty dairymen who have made an increase of 2,000 pounds of milk per cow in three years.

In the Farmers' Union, Ont., section can be given the names of at least twelve dairymen who have increased the yield over 700 pounds of milk per cow in one year.

It is not only the average herds that are helped. For instance, a herd averaging 4,211 pounds of milk per cow, has increased 744 pounds of milk per cow, but a neighbouring good herd, that yielded 6,596 pounds of milk or an average of 2,385 pounds of milk per cow more than the former herd, has been increased by 1,088 pounds per cow. This herd is therefore now giving 7,684 pounds of milk per cow and is a good instance of how cow-testing encourages a dairyman to feed and care for his herd better.

A striking instance is also found here of a well-developed dairyman who is now getting 8,591 pounds of milk per cow, *more than double* the average of four years ago. The old way was just trying to get the cows through on as little feed as possible till the grass came. But he admits he never made any money that way until he commenced to feed what the cows would eat. Now they pay.

Another good increase, showing that there is money made by feeding the cow well and caring for her properly, has been made with a herd that never used to exceed $40 income per cow, but in 1913 was $78.93, *almost double*.

INCREASES in a Herd at St. Hyacinthe, Que.

—		1911.	1912.	1913.
Number of cows	No.	7	7	7
Total yield of milk	Lb.	38,070	40,370	47,640
Total yield of fat	"	1,549	1,699	1,846
Total profit	$	135 70	236 73	247 58
Average per cow	Lb.	5,438	5,767	6,806
Average profit	$	19 38	33 82	35 37

Increase in profit is 82 per cent.

A record is kept of the weights of each kind of feed given to each cow; ensilage and alfalfa are supplied to the cows, and they are particularly well cared for.

TABLE 17.—Herd at Metairie St. Joseph, St. Hyacinthe, Que.

—		1911.	1912	1913.
Number of cows	No.	48	48	48
Average pounds of milk	Lb.	5,413	5,103	6,019
Sold at $2 00 per 100 pounds	$	108 26	102 06	120 38
Cost of feed per cows	"	58 30	58 00	50 00
Profit above cost of feed		49 96	44 06	70 38

The increase in profit over the year 1912 was $26.32, in other words 59 per cent.

In 1906 the herd consisted of 51 cows, with an average yield of 3, 997 pounds of milk. The increase is therefore seen to be 2,022 pounds per cow.

Each cow is fed grain according to her yield of milk, thus the cost of feed is being reduced. The selling price of the milk, used for local consumption, is high, and although the cost of feed is high the profit per cow is good. The profit would not be good unless the most careful attention were paid to the herd, feeding each individual cow according to her special dairy capacity, and keeping records of production. This is the essence of good dairy business and common sense.

IMPROVEMENT in a St. Hyacinthe, Que., Herd.

—		1911.	1912.	1913.
Number of cows	No.	7	7	7
Total pounds of milk	Lb.	24,775	27,320	34,035
Total pounds of fat	"	1,019	1,124	1,444
Cost of feed	$	24 00	26 00	33 35
Total profit	"	79 75	155 29	200 02
Average pounds of milk	Lb.	3,540	3,902	4,865
Average pounds of fat	"	145	160	206
Average profit	$	11 39	22 18	28 58

Cows are far better cared for than formerly, two that made no profit have been weeded out, soiling crops are provided against a summer drought..

The increase in profit is 150 per cent.

THE VALUE OF COW-TESTING.

In the St. Hyacinthe,Que., district are at least fifteen dairymen who can show substantial increases in the yield of milk and fat per cow for the year 1913 since they commenced testing in 1911. Some of these men are now getting 6,800 pounds of milk and 263 pounds of fat per cow. Such increases are as much as 1,380 and 1,400 pounds of milk per cow, indicating increases of 25, 34 and 38 per cent.

In fifteen herds the *increase* in income is over $1,846.

Cow-testing has enabled these progressive dairymen to detect and dispose of 117 worthless cows; it has shown them the value of soiling crops and alfalfa, of pure-bred dairy sires, of ensilage, of providing water in pasture, often by windmills. Cow-testing has shown the value of caring for the herd better; many cows are now being fed more liberally, yet the cost of the milk per 100 pounds is being steadily reduced.

CHAS. F. WHITLEY.

APPENDIX VI.

CREAMERY COLD STORAGE BONUSES.

There were 110 applications for creamery cold storage bonuses received during the year. Of this number 39 were approved and 38 received the full bonus of $100, the remaining creamery receiving $64.50 for a special type of refrigerator. In the other 71 cases the conditions were not complied with.

Full particulars respecting this bonus will be found in Circular No. 6, Dairy and Cold Storage Series, and the plans and specifications which are recommended are contained in Bulletin No. 36 of the same series.

LIST OF THE CREAMERIES that Received the Bonus in 1913-14.

Name of Proprietor or Manager.	Post Office Address.	County.
	QUEBEC.	
Jos. St. Onge	St. Boniface	St. Maurice.
Sévère Boisvert & Frères	St. Sévère	"
Albert Roy	St. Ephrem de Tring	Beauce.
Ovide Blais	St. Grégoire	Nicolet.
Léon Chouinard	St. Paschal	Kamouraska.
Ecole d'Agriculture Rev. Ol. Martin	Ste. Anne de la Pocatière	"
Adjutor Lecompte	St. Pierre	Montmagny.
Syndicat de beurrerie, Albert Tremblay	St. Aubert	L'Islet.
Alp. Perreault	Précieux Sang	Nicolet.
Albert Poulin	St. Victor de Tring	Beauce.
Majorique Lessard	St. François	"
Ludger Monfet	Ste. Croix	Lotbinière.
Edouard Jean	St. Fabien	Rimouski.
Eugene Faucher	St. Flavien	Lotbinière.
Joseph Garneau, *et al.*	St. Flavien	"
Syndicat de beurrerie, A. Douville, Sec	St. Jean Deschaillons	"
Wm. Copping	St. Jean	Iberville.
R. Maillet	St. Honoré de Shenley	Beauce.
Gervais, Jacob & Rivard	St. Stanislas	Champlain.
J. Bolla	St. Cyrille	Drummond.
Albert Bonneau	St. Francois	Montmagny.
Tancrède Dionne	Fraserville	Témiscouata.
H. Gagnon	St. Jean de Dieu	"
Jos. Dumas	"	"
La Cie. de Laiterie, Z. Cloutier, gérant	St. Pierre	Montmagny.
J. G. Roy	Cap Chat	Gaspé.
Montreal Dairy Co.	Montreal	
Leon Gelinas	St. Albert de Warwick	Arthabaska.
F. Vaillancourt	New Richmond	Bonaventure.
W. R. Tannahill	Latchburst	Chateauguay.
	ONTARIO.	
S. R. Brill	Teeswater	Bruce.
J. B. Jackson	Simcoe	Norfolk.
H. A. McIntosh	Fenelon Falls	Victoria.
T. A. Stevens	Wheatley	Kent.
Laurentia Milk Co.	Caledonia	Haldimand.

LIST OF CREAMERIES that Received the Bonus in 1913-14—*Continued.*

Name of Proprietor or Manager.	Post Office Address.	County.
	MANITOBA.	
Elkhorn Creamery Co	Elkhorn	Brandon.
	ALBERTA.	
Innisfail Creamery Co	Innisfail	Red Deer.
	NOVA SCOTIA.	
Rev. A. B. Coté	Meteghan	Digby.
L. C. Leblanc, Sec.-treas	Meteghan River	"

SUMMARY OF BONUSES paid since this policy was first adopted in the year 1897.

544	Creameries have received the full bonus of $100	$54,400 00
145	" " " a bonus of $75	10,875 00
139	" " " " " $50	6,950 00
14	" " " for special refrigerators	1,100 25
842	Totals	73,325 25

APPENDIX VII.

COLD STORAGE SUBSIDIES.

The following is a complete list of the cold storage warehouses erected under contracts for subsidies since the Cold Storage Act was passed in 1907, and which are now in operation:—

Name.	Total Refrigerated Space.	Cost.	Total Subsidy.
	Cu. ft.	$	$
The New Brunswick Cold Storage Co., St. John, N. B.	744,000	167,000 00	50,100 00
Scott & Hogg, Peterborough, Ont	90,000	14,500 00	4,350 00
The Halifax Cold Storage Co., Port Hawkesbury, N.S.	75,000	30,386 69	9,115 99
Cold Storage Ltd., Woodstock, N. B	37,161	25,577 00	7,673 10
The J. D. Moore Co., St. Mary's, Ont	105,000	36,019 62	10,805 88
Lemon Bros., Owen Sound, Ont	33,600	20,000 00	6,000 00
The Chatham Fruit Growers' Association, Chatham, Ont	50,000	19,350 00	5,805 00
The Palmerston Cold Storage Co., Palmerston, Ont	109,984	35,000 00	10,500 00
Davis & Fraser, Charlottetown, P. E. I	150,000	50,000 00	15,000 00
The B. Wilson Co., Victoria, B. C.	64,000	75,000 00	22,500 00
The Trenton Cooperage Mills, Ltd., Trenton, Ont	166,446	50,919 41	15,275 82
The Dominion Fish and Fruit Co., Quebec, P. Q	225,000	222,843 22	66,852 96
The Lockeport Cold Storage Co., Lockeport, N. S.	59,940	56,850 18	17,055 05
The Lawrence Produce Co., Brockville, Ont	106,000	52,000 00	15,600 00
Flavelles Ltd., Lindsay, Ont	131,510	53,000 00	15,900 00
Gunns, Ltd., Harriston, Ont	57,069	38,877 30	11,663 19
Campbell & Hamilton, Calgary, Alta	111,050	90,000 00	27,000 00
The St. Thomas Cold Storage Co., St. Thomas, Ont	174,141	123,700 00	37,110 00
The Brandon Creamery and Supply Co., Brandon, Man.	27,500	32,000 00	9,600 00
O'Keefe & Drew Abattoir Co., Chatham, Ont	144,400	53,741 45	16,122 43
The Canadian Fish and Cold Storage Co., Prince Rupert, B. C.	781,000	350,000 00	105,000 00
Moosejaw Cold Storage Co., Moosejaw, Sask.	189,764	90,000 00	27,000 00
J. H. Sansregret, Joliette, Que	23,394	22,444 10	6,733 23
City Cold Storage Co., Regina, Sask	100,672	48,257 00	14,477 10
The Brantford Cold Storage Co., Brantford, Ont	36,000	29,600 00	8,880 00
The Whyte Packing Co., Mitchell, Ont	30,600	21,000 00	6,300 00
Algoma Produce Co., Sault Ste. Marie, Ont.	55,806	67,000 00	20,100 00
H. & K. Trading Company, Penticton, B. C.	32,164	33,000 00	9,900 00
Edmonton Cold Storage Co., Edmonton, Alta.	150,056	152,000 00	45,600 00
Henri Gauvin, Vonda, Sask.	24,000	22,450 00	6,735 00
North Atlantic Fisheries, Ltd., Port Hawkesbury, N. S	338,550	200,000 00	60,000 00
	4,483,807	2,282,515 97	684,754 97

Further contracts have been entered into with the Acadia Cold Storage Co., Halifax, N.S.; the Lake St. John Cold Storage Co., Herbertville, Que.; the Southern Alberta Cold Storage Co., Lethbridge, Alta.; and J. H. Early, Saskatoon, Sask.

APPENDIX VIII.

SOME STATISTICS OF THE EXPORT AND IMPORT TRADE IN DAIRY PRODUCE.

TOTAL EXPORTS OF CHEESE AND BUTTER in Fiscal Years 1880 to 1914, inclusive.

Butter.			Cheese.		
Year.	Quantity.	Value.	Year.	Quantity.	Value.
Year ended June 30.	Lb.	$	*Year ended June 30.*	Lb.	$
1880	18,535,362	3,058,069	1880	40,368,678	3,853,366
1890	1,951,585	340,131	1890	94,260,187	9,372,212
1891	3,768,101	602,175	1891	106,202,140	9,508,800
1892	5,736,696	1,056,058	1892	118,270,052	11,652,412
1893	7,036,013	1,296,814	1893	133,946,365	13,407,470
1894	5,534,621	1,095,588	1894	154,977,480	15,488,151
1895	3,650,258	697,476	1895	146,004,650	14,253,002
1896	5,889,241	1,052,089	1896	164,689,123	13,956,571
1897	11,453,351	2,089,173	1897	164,220,699	14,676,239
1898	11,253,787	2,046,686	1898	196,703,323	17,572,763
1899	20,139,195	3,700,873	1899	189,827,839	16,776,765
1900	25,259,737	5,122,156	1900	185,984,430	19,856,324
1901	16,335,528	3,295,663	1901	195,926,397	20,696,951
1902	27,855,978	5,660,541	1902	200,946,401	19,986,281
1903	34,128,944	6,954,618	1903	229,099,925	24,712,943
1904	24,568,001	4,724,155	1904	233,980,716	24,184,566
1905	31,754,303	5,930,379	1905	215,733,259	20,300,500
1906	34,031,525	7,075,539	1906	215,834,543	24,433,169
Year ended Mar. 31.			*Year ended Mar. 31.*		
1907 (9 months)	18,078,508	4,011,609	1907 (9 months)	178,141,567	22,006,584
1908	4,786,954	1,068,703	1908	189,710,463	22,887,237
1909	1,326,355	1,521,436	1909	164,907,139	20,384,666
1910	4,615,380	1,010,274	1910	180,859,886	21,607,692
1911	3,142,682	744,288	1911	181,895,724	20,739,507
1912	8,844,402	2,077,916	1912	163,450,684	20,888,818
1913	828,323	223,578	1913	155,216,392	20,697,144
1914	1,228,753	309,046	1914	144,478,340	18,868,785

DETAILED EXPORTS OF DAIRY PRODUCTS for year ended March 31, 1914.

To all countries.		Quantity.	Value.
			$
Cheese	Lb.	144,478,340	18,868,785
Butter	"	1,228,753	309,046
Cream	Gal.	1,323,929	1,289,680
Condensed milk	Lb.	9,339,382	666,941
Casein	"	270,486	11,071
Fresh milk	Gal.	307,188	47,645
Total value			21,193,168

COMPARATIVE VALUE OF DETAILED EXPORTS for Years ended March 31, 1909, 1910, 1911, 1912, 1913 and 1914.

—	1914.	1913.	1912.	1911.	1910.	1909.
	$	$	$	$	$	$
Cheese	18,868,785	20,697,144	20,888,818	20,739,507	21,607,692	20,384,666
Butter	309,046	223,578	2,077,916	744,288	1,010,272	1,521,436
Condensed milk	666,941	25,554	305,678	469,406	541,372	90,520
Fresh milk	47,645	1,412	975	4,276		
Cream	1,289,680	751,123	792,687	1,714,528		
Casein	11,071	15,342	38,302	37,009		
	21,193,168	21,714,153	24,104,376	23,709,014	23,159,336	21,996,622

EXPORTS TO UNITED STATES—Values of Dairy Products Exported to the United States during the Years ended March 31, 1908, 1909, 1910, 1911, 1912, 1913 and 1914.

—	1914.	1913.	1912.	1911.	1910.	1909.	1908.
	$	$	$	$	$	$	$
Cheese	187,335	41,366	31,653	36,034	23,995	19,428	17,732
Butter	111,894	75,192	103,819	91,313	199,854	18,246	38,899
Cream	1,289,655	751,123	792,595	1,714,528	220,446	8,256	2,737
Condensed milk	301,177	5,107	3,983	11,474			
Casein	11,071	15,342	38,302	37,009			
Fresh milk	47,645	1,412	975	3,257			
	1,948,777	889,542	971,327	1,893,615	445,295	45,930	59,368

Down to the beginning of the fiscal year 1911, the exports of fresh milk, cream, condensed milk and casein were included under one head in the Trade and Navigation returns.

STATEMENT of Exports of Butter by Countries in Fiscal Years, 1904 to 1914 inclusive, (Years ended June 30, 1904 to 1906; Years ended March 31, 1907 to 1914).

To	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.
	$	$	$	$	$	$	$	$	$	$	$
Great Britain	4,400,774	5,568,999	6,802,003	3,805,925	823,761	1,273,484	587,493	401,621	1,769,710	173	31,950
British West Indies	127,790	80,323	87,085	59,313	85,371	95,370	76,026	70,444	54,365	26,604	27,970
British Guiana	6,412	8,929	11,654	8,113	12,861	7,711	9,497	10,682	4,865	1,772	5,578
Other British Possessions					5		544	1,423	86	188	560
Newfoundland	82,422	82,387	48,283	56,516	34,931	54,552	50,074	57,198	76,691	62,943	79,669
China	1,763	562	761	5,041	1,319						
Cuba	796	658	285	1,034	720	96	22	985	158	223	69
Danish West Indies	5,868	4,473	4,560	3,664	4,939	4,418	4,697	1,438	2,155	1,158	1,456
Germany	25,641						9,777				
Japan	6,027	6,496	9,373	9,062	4,258	3,019	1,002	840	240		
St. Pierre	26,598	21,827	17,668	17,615	18,749	14,740	14,036	18,560	8,216	12,561	13,497
United States	6,497	70,580	33,965	3,539	38,899	18,246	199,854	91,313	103,819	75,192	111,894
British Africa	16,417	4,914	2,056	265		22,458	1,873	10,460	2,596		
Mexico			1,268	484	265	660	936	59	171	31	
U. S. Colombia	2,272	200	1,747	2,145		1,105	832		69		3,860
Bermuda		50,482	47,045	33,900	33,177	14,273	43,638	54,665	41,209	33,677	25,606
France	14	14,440	4,155								
Holland	8,175	13,680									
Belgium	10	116									10
Central America	686	1,062	3,431	4,932	9,448	7,074	2,500	3,948	3,268	2,890	3,212
Corea		15					15				
Dutch Guiana		186	30	40			48				
Turkey		50		21							
Porto Rico			170								
Panama						4,229	7,320	19,881	10,000	5,420	3,715
Austria-Hungary						1					
Alaska								771	498	746	
Totals	4,724,155	5,930,379	7,075,539	4,011,609	1,068,703	1,521,436	1,010,274	744,288	2,077,916	223,578	309,046

STATEMENT OF EXPORTS OF CHEESE by Countries in Fiscal Years 1904 to 1914 inclusive (Years ended June 30, 1904 to 1906; Years ended March 31, 1907 to 1914.)

To	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.
	$	$	$	$	$	$	$	$	$	$	$
Great Britain	24,099,004	20,174,211	24,300,908	21,909,878	22,763,736	20,268,166	21,481,566	20,577,542	20,733,064	20,497,195	18,533,889
Australia	6,247	5,411	5,350	245	525	223	171	88	58	448	569
British Africa	7,559	10,612	16,623	18,261	16,362	12,466	16,425	22,601	26,873	28,109	26,128
B. W. Indies	34,253	36,176	25,509	13,666	27,533	26,940	24,035	25,844	26,259	24,164	25,990
B. E. Indies	315	62	20	.....	.....	.....	.....	.....	.....	.....	.....
British Guiana	1,193	2,571	3,860	3,143	6,228	4,452	5,232	4,747	7,872	6,975	8,581
Other British Possessions	216	.....	.....	.....	9	1	1,011	1,575	.....	24	1,145
Hong Kong	1,253	1,079	1,029	.....	851	2,452	733	1,077	1,407	3,335	1,912
New Zealand	1,039	1,642	1,795	1,690	1,362	54	1,267	467	645	385	449
Newfoundland	21,754	35,171	30,992	37,748	35,792	41,163	36,912	39,855	44,435	63,900	50,414
Belgium	10	22	287	.....	2,080	.....	.....	1	.....	.....	.....
Cuba	211	102	811	.....	57	.....	17	419	53	852	324
China	1,899	2,013	2,195	2,206	1,572	568	756	1,040	1,302	1,305	987
Danish West Indies	1,936	2,046	2,056	1,568	1,985	1,937	2,453	2,148	2,704	2,416	4,666
France	44	700	7,203	.....	10	81	.....	5,534	38	2,331	.....
Japan	1,609	759	775	1,071	1,444	2,200	1,208	2,700	1,419	2,392	3,697
Philippine Islands	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Pierre	356	341	875	318	190	364	311	338	274	390	295
United States	5,386	14,182	16,082	6,900	17,732	19,428	23,995	36,034	31,653	41,366	187,335
Norway and Sweden	.....	104	994	.....	.....	.....	.....	.....	.....	.....	.....
Germany	.....	364	.....	54	3	.....	102	.....	.....	.....	.....
Bermuda	.....	12,505	14,033	9,080	9,245	3,174	11,385	1,126	10,494	20,738	20,397
Dutch Guiana	23	18	13	9	.....	.....	.....	.....	.....	.....	.....
Mexico	159	329	1,594	630	168	499	108	72	56	26	.....
French West Indies	.....	.....	.....	.....	.....	.....	.....	.....	.....	55	.....
Central America	.....	80	.....	.....	347	3	.....	112	.....	.....	6
Holland	.....	.....	97	110	.....	.....	.....	.....	.....	.....	.....
U. S. of Colombia	.....	.....	68	.....	.....	.....	.....	.....	.....	23	570
Other countries	.....	.....	.....	.....	6	.....	5	142	212	724	1,530
Totals	24,184,566	20,300,500	24,433,169	22,006,584	22,887,237	20,384,666	21,607,692	20,739,507	20,888,818	20,697,144	18,868,785

CHEESE IMPORTS INTO THE UNITED KINGDOM, from British Trade Returns, years ended December 31.

From	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Canada	1,925,835	1,698,847	1,541,502	1,566,546	1,607,064	1,473,275	1,352,570	1,293,768
United States	233,445	114,300	105,555	54,617	38,247	150,321	21,727	22,449
Netherlands	229,341	241,551	279,401	285,329	231,832	207,917	268,286	292,134
New Zealand	126,216	192,301	264,995	368,531	453,785	397,845	543,917	547,182
Other countries	123,957	125,234	114,633	115,067	125,427	118,964	122,787	142,046
Total	2,638,794	2,372,233	2,306,086	2,390,090	2,456,340	2,348,326	2,308,787	2,297,579
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Canada	73·0	71·7	66·8	65·5	65·5	62·7	58·6	56·3
United States	8·8	4·8	4 6	2·3	1·6	6·4	0·9	1·0
Netherlands	8·7	10·2	12·1	12·0	9 4	8·9	11 6	12·7
New Zealand	4·8	8·1	11·5	15.4	18·5	16·9	23 6	23·8
Other countries	4·7	5·2	5·0	4·8	5·0	5·1	5·3	6·2
Total	100 0	100·0	100 0	100·0	100·0	100·0	100·0	100·0

BUTTER IMPORTS INTO THE UNITED KINGDOM from British Trade Returns, Years ended December 31.

From	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt,	Cwt.	Cwt.
Russia	606,549	657,549	639,118	601,712	584,040	638,284	683,650	751,414
Sweden	182,803	226,740	238,929	312,142	345,684	360,357	335,014	332,331
Denmark	1,675,761	1,818,811	1,857,103	1,764,027	1,726,091	1,707,178	1,618,048	1,706,759
Germany	10,701	7,297	3,195	2,965	3,481	.....	.....	.....
Netherlands	195,366	168,496	244,356	148,567	154,537	104,655	113,716	153,172
France	319,401	281,306	394,612	413,306	361,249	171,080	246,652	248,579
United States	157,312	1,063	39,540	693	756	23,052	2,596	164
Australia	545,827	598,986	409,106	384,619	639,093	874,399	541,253	588,39[illegible]
New Zealand	311,672	313,863	221,395	278,581	362,674	276,446	349,012	251,663
Canada	190,968	34,753	47,877	22,522	16,805	61,936	27	813
Other countries	140,898	101,192	115,590	133,699	131,129	85,305	115,191	105,728
Total	4,337,258	4,210,156	4,210,821	4,062,833	4,325,539	4,302,692	4,005,159	4,139,022
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Russia	14·1	15·6	15·2	14·8	13·5	14·8	17·1	18·2
Sweden	4·2	5·4	5·7	7·7	7·9	8·4	8·4	8·0
Denmark	38·6	43·2	44·1	43·4	39·9	39·7	40·4	41·2
Germany	0·3	0·2	0·1	0 07	0·09	.....	.....	.....
Netherlands	4·5	4·0	5·8	3·7	3·9	2·4	2·8	3·7
France	7·1	6·7	9·7	10·1	8·4	4 0	6·1	6·0
United States	3·6	0·03	0·9	0·01	0 01	0·5	0·0	0·0
Australia	12·5	14·2	9·5	9·5	14·7	20·3	13·6	14·2
New Zealand	7·2	7·5	5·3	6·9	8·3	6·4	8·7	6·1
Canada	4·4	0·8	1·1	0·6	0·3	1·4	0·0	0·0
Other countries	3·5	2·4	2·6	3·3	3·0	2·1	2·9	2·6
Total	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0

N.B.—1913 figures unrevised.

IMPORTS OF DAIRY PRODUCE, for Consumption in Canada, during the Years ended March 31.

—	1910.	1911.	1912.	1913.	1914.
	Lb.	Lb.	Lb.	Lb.	Lb.
Cheese	683,778	866,653	919,189	1,495,758	1,512,108
Butter	393,582	1,227,390	3,874,587	7,989,269	7,317,259
Condensed Milk	256,124	173,309	133,365	261,555	453,417

IMPORTS OF BUTTER BY COUNTRIES during the Years ended March 31.

Country.	QUANTITIES.				
	1910.	1911.	1912.	1913.	1914.
	Lb.	Lb.	Lb.	Lb.	Lb.
Great Britain	6,161	29,252	700,900	767,131	91,900
Australia	299,440	438,870	101,640	98,112	227,602
New Zealand	21,840	464,951	2,139,944	6,018,022	6,732,155
Turkey	240	167	165	.....	1,882
United States	61,081	293,937	929,318	1,100,431	262,840
Other countries	4,820	213	2,620	5,573	880
Totals	393,582	1,227,390	3,874,587	7,989,269	7,317,259

Refrigerator car inspector testing temperature of butter at railway terminals, Montreal.

Refrigerator car inspector examining bunker for ice supply at Montreal.

Cargo inspection preparatory to placing thermographs in refrigerated chambers and holds of steamship at Montreal.

Cargo inspector supervising the loading of cheese at Montreal.

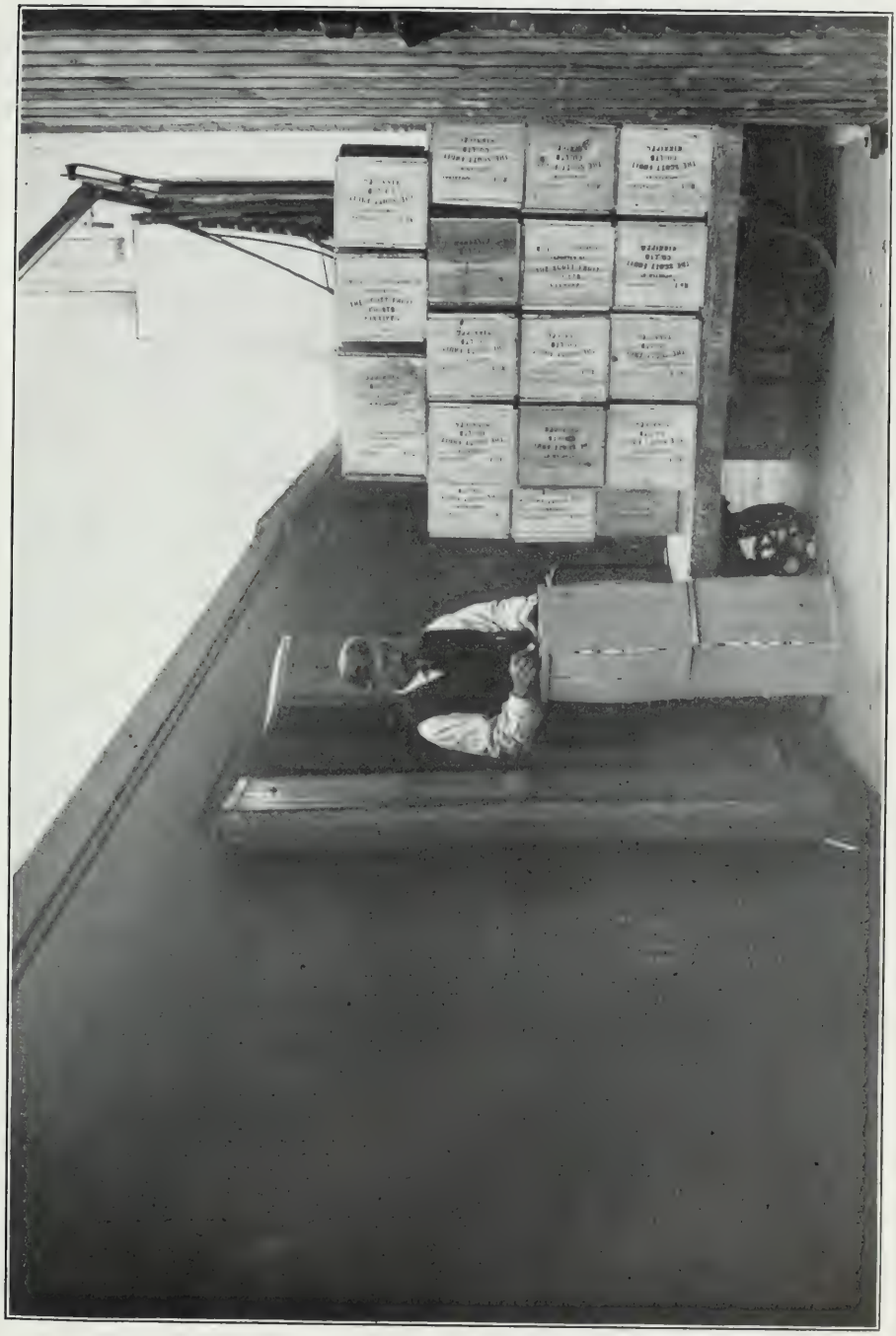
Cargo Inspection Service—Unloading Canadian cheese at London, Eng.

Cargo Inspection Service—Loading Nova Scotian apples at Halifax.

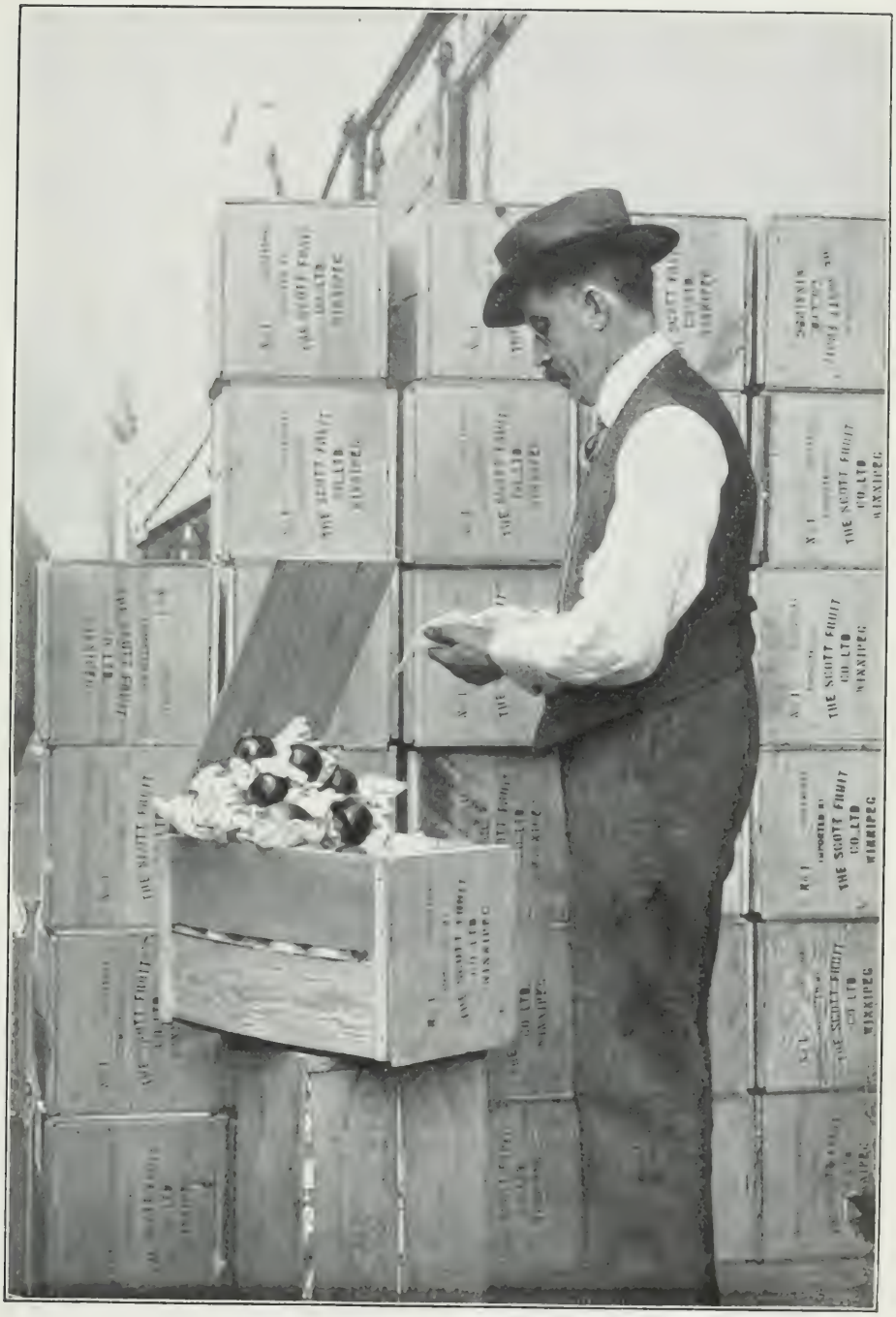
Apple warehouse in Nova Scotia.

Fruit Inspectors at work in Nova Scotia.

Inspecting Ontario apples in Western Canada.



Marking imported apples in accordance with the Amendments of 1913.



Inspecting imported apples, and showing importer's brand.

Apple picking class

Demonstrating apple packing at the Toronto Fruit, Flower and Honey Show, 1913.

DEPARTMENT OF AGRICULTURE

CANADA

REPORT

OF THE

VETERINARY DIRECTOR GENERAL

(F. TORRANCE, B.A., D.V.S.)

FOR THE YEAR ENDING MARCH 31, 1914

PRINTED BY ORDER OF PARLIAMENT.

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1915.

[No. 15b—1915.]

REPORT

OF THE

VETERINARY DIRECTOR GENERAL

HEALTH OF ANIMALS BRANCH,

OTTAWA, March 31, 1914.

SIR,—I have the honour to present my report as Veterinary Director General for the year ending March 31, 1914.

Following the lines laid down by my predecessor, Dr. Rutherford, the work of the branch has been continued with more or less success. In some directions, such as the control of glanders and of mange, much progress has been made; the country has been protected against invasion by diseases foreign to it; additional facts have been brought to light by the members of the branch engaged in scientific research; and there has been a marked advance in the division entrusted with the inspection of meat and canned foods.

On the other hand, I have to report a serious outbreak of dourine in the Province of Alberta, and continued losses from hog cholera. Both have been dealt with in a vigorous manner, and progress has been made, as will be seen in subsequent pages when the diseases are respectively commented upon.

The members of the staff, both in the inside and the outside service, have performed their duties, almost without exception, in a careful and earnest spirit, and I desire here to offer them my sincere thanks. Without their hearty co-operation the work of the branch would have suffered materially, and satisfactory progress could not have been made.

The following is a detailed statement of the diseases dealt with:—

GLANDERS.

The number of horses destroyed on account of this disease is much less than in any year since the policy of slaughtering reactors was put in operation. Three hundred and fifty-three (353) were slaughtered in 1914 as against six hundred and thirty-eight (638) in 1913. These figures are very encouraging and show conclusively that our policy of dealing with the disease is the right one. It may be added that Canada was the first country to adopt this policy, which has since been followed with success by many others.

STATISTICS.

DOMINION.

4 killed on inspection.
309 killed at first test.
37 " second test.
3 " third test.

353, valued at $51,845, at a cost of $34,563.31.

146 showed clinical symptoms.

12,430 horses were tested with mallein, of which 349 reacted and were destroyed. Of the 349 reactors, 142 showed clinical symptoms of glanders at or during the test.

23 horses are under control for retest.

Of the above 353 horses slaughtered, 7 were killed without compensation as being diseased when imported into Canada.

PRINCE EDWARD ISLAND.

1 horse was tested and proved to be healthy.

NOVA SCOTIA.

23 horses were tested and proved to be healthy.

NEW BRUNSWICK.

1 killed at first test; no compensation was allowed for this horse, it being imported from the United States.

1 showed clinical symptoms.

186 horses were tested with mallein, of which 1 reacted and was destroyed. The reactor showed clinical symptoms of glanders at the time of testing.

No horses are under control for retest.

The horse slaughtered was in the electoral district of St. John.

QUEBEC.

38 killed at first test.
2 " second test.

40, valued at $6,700.00, at a cost of $4,466.66.

27 showed clinical symptoms.

674 horses were tested with mallein of which 40 reacted and were destroyed. Of the 40 reactors, 27 showed clinical symptoms of glanders at or during the test.

1 horse is under control for retest.

Of the 40 horses slaughtered—

28 were in the electoral district of Chicoutimi and Saguenay.
2 " " " Drummond.
4 " " " Maskinongé.
3 " " " Richelieu.
2 " " " Shefford.
1 was " " " Temiscouata.

ONTARIO.

2 killed at first test, valued at $235.00, at a cost of $156.66.

2 showed clinical symptoms.

902 horses were tested with mallein of which 2 reacted and were destroyed. Of the 2 reactors, 2 showed clinical symptoms of glanders at or during the test.

2 horses are under control for retest.

Of the 2 horses slaughtered—

1 was in the electoral district of Frontenac.
1 " " " Ontario (N.R.).

MANITOBA.

19 killed at first test.
1 " second test.

20, valued at $2,670.00, at a cost of $1,780.00.

6 showed clinical symptoms.

1,735 horses were tested with mallein of which 20 reacted and were destroyed. Of the 20 reactors, 6 showed clinical symptoms of glanders at or during the test.

No horses are under control for retest.

Of the 20 horses slaughtered—

9 were in the electoral district of Dauphin.
2 " " Lisgar.
9 " " Portage la Prairie.

SASKATCHEWAN.

167 killed at first test.
21 " second test.
1 " third test.

189, valued at $28,605, at a cost of $19,070.

71 showed clinical symptoms.

4,715 horses were tested with mallein of which 189 reacted and were destroyed. Of the 189 reactors, 71 showed clinical symptoms of glanders at or during the test.

20 horses are under control for retest.

Of the 189 horses slaughtered—

8 were in the electoral district of Assiniboia.
7 " " Battleford.
27 " " Humboldt.
17 " " Mackenzie.
86 " " Moosejaw.
33 " " Regina.
11 " " Saskatoon.

ALBERTA.

4 killed on inspection.
80 killed at first test.
13 " second test.
2 " third test.

99, valued at $13,420.00, at a cost of $8,946.66.

37 showed clinical symptoms.

2,589 horses were tested with mallein of which 95 reacted and were destroyed. Of the 95 reactors, 33 showed clinical symptoms of glanders at or during the test.

No horses are under control for retest.

Of the 99 horses slaughtered—

4 were in the electoral district of Calgary.
7 " " Edmonton.
26 " " Macleod.
48 " " Medicine Hat.
8 " " Red Deer.
6 " " Strathcona.

BRITISH COLUMBIA.

2 killed at first test, valued at $215.00, at a cost of $143.33.

2 showed clinical symptoms

1,590 horses were tested with mallein of which 2 reacted and were destroyed. Of the 2 reactors, 2 showed clinical symptoms of glanders at or during the test.

No horses are under control for retest.

Of the 2 horses slaughtered—

1 was in the electoral district of Vancouver.

1 " " Yale-Cariboo.

YUKON.

15 horses were tested with mallein and proved to be healthy.

HOG CHOLERA.

The losses occasioned by this disease in 1913 have been surpassed by the year 1914, and I regret to report that in the Dominion some 9,900 hogs were slaughtered as diseased or in contact with the disease, at a cost of $61,588.44 in compensation. These figures are much higher than we could wish, but their loss must be looked upon as the price we have to pay for keeping the rest of our hogs healthy, and as the hog population of Canada is approximately 8,000,000, the loss of even ten thousand is not high.

The policy of slaughter of all affected herds has been pursued as before, and as a proof of its efficiency we may cite the fact that the disease rarely breaks out a second time on premises where it has been extirpated. The vast majority of the outbreaks occur on premises where the disease was previously unknown, showing the possibility of entirely eradicating the disease if fresh sources of infection could be controlled.

The feeding of uncooked garbage to hogs continues to be, in many cases, the cause of the initial outbreak. From this starting point the disease quickly spreads to adjoining premises, and may attain large dimensions before it has been brought under control. The neglect of owners to notify the department of the existence of the disease is the chief reason for this, and arises generally from ignorance of the proper course to pursue when hogs are first noticed to be sick. In some cases, however, there is reason to think that owners are loath to report cases of disease for fear of the loss they may be called upon to sustain if hog cholera is found to exist and their herd is destroyed. A more liberal valuation of hogs slaughtered would tend to remove this objection on the part of owners to promptly report suspicious cases, and in my opinion would save the department more than it would cost, besides removing a cause of dissatisfaction with our policy.

As some criticism has appeared from time to time directed against our system of dealing with this disease by slaughtering affected animals as well as those in contact with them, and advocating the methods used in the United States some explanation of our reasons for preferring our present system will be in order.

In dealing with hog cholera by immunization, two methods may be used. The serum alone method consists in injecting into the hog it is desired to protect a dose of serum, obtained from the blood of another hog which has been artificially rendered exceedingly resistant to the disease. Such a hog is known as a hyper-immune and a dose of its serum injected into a susceptible hog will render it also immune to hog cholera. The immunity conferred in this way is, however, of short duration, and disappears after a time, leaving the hog as ready to contract the disease as before.

In order to obtain a lasting immunity, the simultaneous or double system is adopted. This involves the injection of virulent or highly infective blood at the same time that the protective serum is injected. When the dose of each is properly pro-

portioned to the weight of the hog, and the serum and virus are both of requisite strength, a degree of immunity is produced that lasts much longer than when serum alone is used.

If it were practicable to thus render all the hogs in a country immune, there is no doubt that the disease could in that way be controlled, but it would have to be continued indefinitely, for the immunity of the sow is not conferred on its young, and these would die of the disease unless also immunized. In order to obtain the necessary serum and virus the disease must be kept alive in the laboratories where these agents are prepared, and consequently the country adopting this method will always have the disease.

The experience of such countries shows that instead of controlling the disease, immunization methods tend to render it more widespread. Active virus has been sent out from laboratories directly to farmer with instructions how to use it; the accompanying serum has failed to give the protection expected, and fresh outbreaks have occurred. Even when the necessary immunity has been produced the danger is not over. The immunized hog, while protected against the disease itself, harbours the germs for an unknown period and, if brought into contact with susceptible hogs, is capable of communicating the disease.

I am convinced that the simultaneous method of immunization has done more to spread hog cholera in the United States than any other agent, and although our losses from this disease are heavy, I believe they would be still heavier under that system.

Statistics.

NEW BRUNSWICK.

One outbreak of hog cholera occurred in New Brunswick, in which 9 hogs, valued at $117 were destroyed in the undermentioned district at a cost of $78 in compensation.

Two premises were also quarantined on suspicion, involving the control of 159 hogs.

	No. of outbreaks.	Hogs destroyed.
Westmoreland	1	9

QUEBEC.

Twenty-seven outbreaks of hog cholera occurred in Quebec, in which 440 hogs, valued at $6.912, were destroyed in the undermentioned districts, at a cost of $4,607.93 in compensation.

Fifty-four premises were also quarantined on suspicion, involving the control of 659 hogs.

One hog, valued at $12, was destroyed for purposes of examination, but no evidence of hog cholera was found.

District.	No. of outbreaks.	Hogs destroyed.
Brome	6	70
Compton	4	11
Missisquoi	16	190
Quebec	1	169
	27	440

ONTARIO

Ninety-six outbreaks of hog cholera occurred in Ontario, in which 2,016 hogs, valued at $19,071, were destroyed in the undermentioned districts, at a cost of $1,114 in compensation.

Fifty-nine premises were also quarantined on suspicion, involving the control of 1,051 hogs.

Three hogs, valued at $22 were destroyed for purposes of examination, but no evidence of hog cholera was found.

District.	No. of outbreaks.	Hogs destroyed.
Algoma	1	36
Brantford	1	12
Essex (N.R.)	45	673
Essex (S.R.)	19	639
Kent (W.R.)	2	38
Lanark	1	8
London	7	128
Middlesex (E.R.)	1	47
Nipissing	7	136
Ontario (S.R.)	3	42
Oxford (N.R.)	1	48
Peel	1	16
Welland	1	40
York (C.R.)	6	153
	96	2,016

MANITOBA.

Twenty outbreaks of hog cholera occurred in Manitoba, in which 402 hogs, valued at $4,447.50, were destroyed in the undermentioned districts, at a cost of $2,964.95 in compensation.

Twenty premises were also quarantined on suspicion, involving the control of 279 hogs.

District.	No. of outbreaks.	Hogs destroyed.
Dauphin	8	43
Lisgar	9	194
Macdonald	2	32
Selkirk	1	133
	20	402

SASKATCHEWAN.

Two hundred and eighty-three outbreaks of hog cholera occurred in Saskatchewan, in which 5,791 hogs, valued at $82,622.13, were destroyed in the undermentioned districts, at a cost of $21,348.08 in compensation.

One hundred and sixty-four premises were also quarantined on suspicion, involving the control of 1,756 hogs.

Thirty-four hogs, valued at $264.90 were destroyed for purposes of examination, but no evidence of hog cholera was found.

District.	No. of outbreaks.	Hogs destroyed.
Assiniboia	83	694
Battleford	9	239
Humboldt	16	257
Moose Jaw	153	2,071
Qu'Appelle	1	27
Regina	2	41
Saskatoon	19	462
	283	3,791

ALBERTA.

Fifty-four outbreaks of hog cholera occurred in Alberta in which 2,393 hogs, valued at $20,731.75, were destroyed in the undermentioned districts at a cost of $13,821.16 in compensation.

Fifty premises were also quarantined on suspicion, involving the control of 2,139 hogs.

Twenty-three hogs, valued at $262, were destroyed for purposes of examination, but no evidence of hog cholera was found.

District.	No. of outbreaks.	Hogs destroyed.
Calgary	9	143
Edmonton	15	481
Macleod	4	424
Medicine Hat	19	1,182
Red Deer	1	77
Strathcona	6	86
	54	2,393

BRITISH COLUMBIA

Fifty-three outbreaks of hog cholera occurred in British Columbia, in which 849 hogs, valued at $8,481.50, were destroyed in the undermentioned districts, at a cost of $5,654.32 in compensation.

Forty-five premises were also quarantined on suspicion, involving the control of 1,440 hogs.

Three hogs, valued at $24.98 were destroyed for purposes of examination, but no evidence of hog cholera was found.

District.	No. of outbreaks.	Hogs destroyed.
Comox-Atlin	3	77
Kootenay	4	76
Nanaimo	17	91
New Westminster	19	409
Vancouver	3	45
Yale-Cariboo	7	151
	53	849

DOURINE.

The prospect of an early eradication of this disease has been dimmed by the unfortunate experience of the past year. An outbreak of large proportions was detected during the summer in a herd of range horses south of Lethbridge, Alta. Prompt measures were taken to deal with it. All range horses in the district were placed under restrictions, and an examination of every mare and stallion undertaken. Samples of blood were taken by our inspectors and sent to the laboratory at Lethbridge, where they were submitted to the complement fixation test by our pathologist, Dr. A. Watson, and his assistants.

It soon became evident that we had to deal with an outbreak of far greater proportions than any that had preceded it. A vast amount of work was required to round up the range horses, take samples of blood, make tests, trace movements of mares sold into other districts, and to follow up every line of infection to its end. This work was carefully and energetically carried out by our officers in Alberta, and while all are deserving of praise for their diligence, I wish specially to mention Inspectors Watson and Hawke for arduous and tedious work of the laboratory, which they performed with diligence and care; and also Inspectors Gallivan and Busselle, who did much of the work in the field. The services of Inspector Hargrave in this matter were also of great value to the department.

As a result of this work a large number of infected mares and stallions were found. These were all destroyed, and we have reason to hope that the worst of the trouble is over. Careful supervision of the district will be maintained, and no stallion will be used for breeding purposes until tested and found free from disease.

Statistics.

Four hundred and seventy-one animals, valued at $73,115, were slaughtered as being affected with this disease, at a cost of $48,743.33 distributed as follows:—

SASKATCHEWAN.

District.	Suspected and quarantined.	Slaughtered.
Battleford		9
Humboldt	5	
Moose Jaw	67	1
Qu'Appelle		1
Regina	7	1
	79	12

ALBERTA.

District.	Suspected and quarantined.	Slaughtered.
Calgary	21	6
Macleod	40	23
Medicine Hat	4,330	430
Red Deer	6	
	4,397	459

CATTLE MANGE.

The statistics of this disease show that progress is being made, the number of outbreaks and of animals affected showing a considerable diminution compared with the year before.

STATISTICS.

Province.	Outbreaks.	Animals affected.	Animals quarantined.
Nova Scotia	1	5	5
Saskatchewan	16	181	8,178
Alberta	104	2,538	53,303
British Columbia	.....	.....	663
	121	2,724	62,149

49,503 cattle and 2 buffaloes were inspected on being presented for shipment from the quarantined areas in Saskatchewan and Alberta.

106,576 cattle were inspected in Winnipeg on arrival from points west thereof.

HORSE MANGE.

This disease continues to furnish a moderate number of outbreaks, pretty well distributed over the country from east to west. As this disease is not often looked upon by horse owners with any apprehension, it often goes without notification to the department until it has spread to such an extent as to cause alarm. On this account it is more difficult to exterminate than much more serious maladies.

STATISTICS.

Province.	Outbreaks.	Animals affected.	Animals quarantined.
Quebec	10	13	20
Ontario	44	96	419
Manitoba	3	13	44
Saskatchewan	31	177	227
Alberta	10	106	928
	98	405	1,638

11,886 horses and 227 mules were inspected on being presented for shipment from the quarantined area in Alberta and Saskatchewan.

RABIES.

Ontario and British Columbia were the only provinces in which rabies made its appearance during the year. Prompt measures were taken to have all dogs in infected localities tied up or muzzled, and no fatalities are reported in human beings from this dread disease.

Statistics.

In *Ontario*, 56 premises were quarantined on account of the prevalence of rabies in the adjacent districts, distributed as follows:—

District.	Premises quarantined.
Huron	5
Northumberland	5
Peel	11
Simcoe	2
Waterloo	2
Wellington	2
York	29
	56

In *British Columbia*, 18 premises were quarantined on account of the prevalence of rabies in the adjacent districts, distributed as follows:—

District.	Premises quarantined.
Nanaimo	13
New Westminster	5
	18

SHEEP SCAB.

Apart from a small outbreak in Quebec, and a slightly larger one in Manitoba, the country was entirely free from this disease. The Manitoba outbreak was peculiar in occurring in a remote district inhabited by Icelanders, where it was impossible to discover any probable source of infection.

Statistics.

In *Quebec*, 38 sheep on two premises were quarantined, 4 being affected with sheep scab, distributed as follows:—

District.	Affected.	Quarantined.
Yamaska	4	38

In *Manitoba,* 399 sheep on thirteen premises were quarantined, 200 being affected with sheep scab, distributed as follows:—

District.	Affected.	Quarantined.
Dauphin	200	347
Lisgar		52
	200	399

In accordance with the Quarantine Regulations, 11,002 sheep imported into Canada were quarantined for the prescribed period of thirty days.

SCABIES IN FOXES.

Two foxes were found affected with this disease in Prince Edward Island, involving the control of 30 animals on five premises.

TUBERCULOSIS.

No change having been made in the Dominion regulations, there is no satisfactory progress to be reported in connection with the disease. We continue to test cattle for export to the United States and to British Columbia, and we also test a number of herds for owners who have voluntarily placed them under our control, and in this way are gaining experience in dealing with it.

There is no doubt that the disease is widespread and more contagious than is generally thought by stockmen. The evidence of this is found in the large number of hogs found tuberculous on post-mortem examination in our abattoirs. These hogs contract the disease from tuberculous cows in two ways, by drinking milk or whey carrying the infection, or else by running in the same yard or stable with cows. Investigation has shown that the manure of tuberculous cows is highly infective. Hogs that are allowed to root over manure are almost certain to become affected if there is tuberculosis in the herd. When many hogs are found diseased, it is safe to assert that cattle are largely affected, and our statistics prove that tuberculosis of hogs is on the increase.

Farmers could avoid this loss by testing their herds and getting rid of reactors, or if this is impossible, it might be diminished by keeping the pigs away from the cows or their manure, and by boiling any milk, buttermilk, or whey fed to them.

Statistics.

Five hundred and eighteen cattle were tested on being imported into Canada, 16 of which reacted, 5 were classed as suspicious, and 497 proved healthy.

One thousand seven hundred and fifty-nine cattle were tested for export, 88 of which reacted, 8 were classed as suspicious and 1,663 proved healthy.

Two thousand eight hundred and thirty-two cattle were tested, some for shipment to different provinces of the Dominion, and other in herds under the supervision of this department, 304 of which reacted, 87 were classed as suspicious, and 2,441 proved healthy.

Three thousand seven hundred and twenty cattle were tested by private practitioners, 346 of which reacted, 76 were classed as suspicious, and 3,298 proved healthy.

All reactors were permanently earmarked by a veterinary inspector in cases where the owner did not voluntarily destroy them.

ANTHRAX.

A few outbreaks of anthrax occurred during the year and were dealt with by immunizing the exposed animals with vaccine prepared at our laboratory.

Black-leg vaccine was in great demand during the year.

Statistics.

The following outbreaks were reported and dealt with during the year:—

Province.	Outbreaks.	Animals quarantined.
Quebec	15	386
Ontario	5	81
British Columbia	1	
	21	467

Four hundred and eighty-six doses of Anthrax vaccine, and 38,871 doses of Black-leg vaccine were distributed during the year.

LABORATORIES.

The principal laboratory of the branch is the Biological Laboratory at the Central Experimental Farm, Ottawa, which has been for many years under the charge of C. H. Higgins, D.V.S. Here are prepared the various vaccines and other biological products used in the control and detection of contagious diseases of animals. Tuberculin, mallein, vaccines for anthrax, blackleg, strangles, etc., are prepared, tested, bottled, and sent out.

As the accuracy of diagnosis depends in many cases upon the reliability of the test fluid used, it is most important that every care should be taken that such fluids as tuberculin and mallein should be thoroughly trustworthy. The method of testing tuberculin, on laboratory animals, not seeming to me sufficiently practical and reliable, I have adopted a new method. A large number of cattle, say fifty, that are about to be killed at one of the large abattoirs, are held and tested by our officers with the tuberculin on trial. After the test is completed, the animals are all slaughtered, and the results of post-mortem examination compared with the tuberculin test. Unless the tuberculin is accurate in picking out all the tuberculous animals, it is condemned, and further trials made until a satisfactory result is attained. All our tuberculin is tested in this way at the present time, and I think is as reliable as can be made.

At this laboratory a considerable amount of research work is done, and there will be found elsewhere in this report some account of an investigation into the nature and cause of black-head in turkeys. Pathological specimens sent in by our inspectors and others are received and examined for diagnosis.

The Lethbridge (Alta.) laboratory, under the charge of Dr. Watson, has been doing excellent work in the diagnosis of dourine. The extensive outbreak in southern Alberta, already mentioned, has entailed the examination of thousands of blood samples taken from suspected mares and stallions.

The test employed, the complement fixation test, is extremely delicate and complicated, requiring the greatest skill and care in its application. In the hands of Dr. Watson and his assistants it has demonstrated, again and again, its wonderful accuracy. While not infallible, the test seldom makes a mistake, and has enabled the department to deal with this outbreak of dourine in a scientific manner.

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Swamp fever experiments have been continued, chiefly along the line of discovering a laboratory test by which the disease can be diagnosed before reaching an advanced stage. The usual symptoms of this disease are not seen until it has made some progress, and in many cases the victim is then beyond the aid of treatment. A test for it, such as the complement fixation test for dourine, or the mallein test for glanders, would be a great step in advance, and might lead to rational methods of control. Progress has been made in this search, but at present no definite results are to be reported.

At Agassiz, B.C., we maintain a small laboratory on the Experimental Farm there. Dr. Seymour Hadwen is in charge, and has been devoting himself to the investigation of red water in cattle, and other matters affecting the health of live stock. His report appended hereto is of interest.

QUARANTINES.

A new quarantine ground has been acquired at Lévis, Que., and progress made in fencing and erecting buildings. A piece of land comprising some 127 acres was bought, on the south shore of the St. Lawrence, about 6 miles west of Point Lévis, and 3 miles from the old quarantine ground. On the north, this land extends to the track of the Intercolonial railway, and a spur has been constructed so that cattle can be unloaded from the cars within our own grounds, thus removing the great objection to the former arrangement, where cattle entering quarantine had to traverse the public highway.

As many of the old buildings as are fit to move will be transferred to the new quarantine, and others erected as may be necessary from time to time, until we have all the accommodation required for taking care of the shipments received from England, sometimes in large numbers. Sufficient progress has already been made in this work to indicate that the new quarantine will be a great improvement over the last, satisfactory to importers and creditable to the department.

At other points where quarantines are maintained, some minor improvements have been made and the property of the department maintained in good condition.

IMPORT TESTING.

7,877 horses were tested on arrival from the United States, and allowed to proceed to their destination.

Entered at—	Number.	Entered at—	Number.
Charlottetown, P.E.I.	1	Rainy River, Ont.	15
Halifax, N.S.	3	Sarnia, Ont.	123
Yarmouth, N.S.	17	Sault Ste. Marie, Ont.	19
Aroostook Jct., N.B.	51	Toronto, Ont.	2
Debec Jct., N.B.	5	Windsor, Ont.	317
Edmundston, N.B.	15	Bannerman, Man.	95
Florenceville, N.B.	4	Emerson, Man.	1,031
Grand Falls, N.B.	14	Gretna, Man.	287
McAdam Jct., N.B.	19	Snowflake, Man.	136
St. John, N.B.	15	Sprague, Man.	2
St. Leonards, N.B.	24	Big Muddy, Sask.	215
St. Stephen, N.B.	25	Maple Creek, Sask.	2
Woodstock, N.B.	9	Marienthal, Sask.	117
Abercorn, Que.	23	Northgate, Sask.	7
Athelstan, Que.	30	North Portal, Sask.	1,517
Beauceville, Que.	104	Saskatchewan General.	2
Beebe Jct., Que.	52	Willow Creek, Sask.	138
Coaticook, Que.	9	Wood Mountain, Sask.	631
Comin's Mills, Que.	12	Coutts, Alta.	387
Dundee, Que.	21	Pinhorn, Alta.	24
Highwater, Que.	18	Twin Lakes, Alta.	228
Lacolle Jct., Que.	31	Bridesville, B.C.	128

Entered at—	Number.	Entered at—	Number.
Lake Megantic, Que	50	Gateway, B.C.	60
Montreal, Que	9	Grand Forks, B.C.	194
Noyan Jct., Que	11	Huntingdon, B.C.	149
Ste. Agnes de Dundee, Que	8	Kerenaos, B.C.	69
St. Armand, Que	21	Kingsgate, B.C.	337
St. Johns, Que	11	Midway, B.C.	46
Sherbrooke, Que	79	Myncaster, B.C.	42
Brockville, Ont	100	Nelson, B.C.	23
Brockville, Ont	8	Osoyoos, B.C.	353
Cornwall, Ont	16	Rossland, B.C.	41
Fort Frances, Ont	139	Rykerts, B.C.	24
Kingston, Ont	9	Vancouver, B.C.	32
Merrisburg, Ont	11	Victoria, B.C.	11
Niagara Falls, Ont	65	White Rock, B.C.	38
Port Arthur, Ont	8	White Horse, Y.T.	13
Prescott, Ont	15		

IMPORT INSPECTIONS FROM UNITED STATES AND NEWFOUNDLAND.

Port.	Horses.	Mules.	Cattle.	Sheep.	Swine.	Goats.	Asses.	Elk.	Elephants.
Charlottetown, P.E.I.	2		1	22					
Halifax, N.S.	11	1	1	2					
Sydney, N.S.	21								
Yarmouth, N.S.	28		4	10					
St. John, N.B.	30			316	6				
St. Stephen, N.B.	72		9				2		
McAdam Junction, N.B.	31		26	66					
Debec Junction, N.B.	5								
Woodstock, N.B.	9								
Florenceville, N.B.	4			13					
Aroostook Junction, N.B.	54		9	27					
Grand Falls, N.B.	16								
St. Leonard, N.B.	24								
Edmundston, N.B.	15		1						
N. B. General	5								
Comin's Mills, Que.	12		3						
Lake Megantic, Que.	48	4							
Beauceville, Que.	130								
Coaticook, Que.	9								
Beebe Junction, Que.	66		8						
Sherbrooke, Que.	87			27					
Highwater, Que.	56		4						
Abercorn, Que.	40		2						
St. Armand, Que.	216	13	30	19					
Lacolle Junction, Que.	416	3	26						
Noyan Junction, Que.	80	7	29			5			
St. Johns, Que.	13	33	1						
Montreal, Que.	1								
Athelstan, Que.	151	1	14	4		1			
Dundee, Que.	50		124						
St. Agnes de Dundee, Que.	39		2						
Cornwall, Ont.	37								
Prescott, Ont.	130		12			1			
Morrisburg, Ont.	28								
Brockville, Ont.	11		11	1		6			
Kingston, Ont.	25		2						
Toronto, Ont.	42								
Niagara Falls, Ont.	326	14	46	564		6			
Lodgeburg, Ont.	828	6	13	3,171					
Windsor, Ont.	1,312	41	144	70	31	10		1	5
Sarnia, Ont.	318	23	118	2,516	3	5			
Sault Ste. Marie, Ont.	33		5	1		7			
Port Arthur, Ont.	8								
Rainy River, Ont.	17		2						
Fort Frances, Ont.	210	2	50		4	4			
Emerson, Man.	5,629	468	1,538	13,084	128	19			
Gretna, Man.	949	192	219	20,741		5			
Snowflake, Man.	146		22						
Bannerman, Man.	260	3	88	1,895	1	5			
Carried forward.	12,050	811	2,564	42,549	173	72	2	1	5

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IMPORT INSPECTIONS FROM UNITED STATES AND NEWFOUNDLAND—*Concluded.*

Port.	Horses.	Mules.	Cattle.	Sheep.	Swine.	Goats.	Asses.	Elk.	Elephants.
Brought forward ...	12,050	811	2,564	42,549	173	72	2	1	5
Manitoba General.	2	.....	3	.....	.....	.....	.....	.....	.....
North Portal, Sask.....	8,599	554	4,930	196	18	9	11	.....	.....
Northgate, Sask	94	4	15	.....	.....	.....	.....	.....	.....
Marienthal, Sask.....	276	7	47	.....	.....	.....	.....	.....	.....
Wood Mountain, Sask ..	1,420	28	51	8,803	.....	.....	.....	.....	.....
Big Muddy, Sask... ..	1,063	27	40	.....	.....	.....	.....	.....	.....
Willow Creek, Sask.....	211	4	.....	3,462	.....	.....	.....	.....	.....
Saskatchewan General ..	4	.....	.....	.....	.....	.....	.....	.....	.....
Pinhorn, Alta.....	48	5	12	7,699	.....	.....	.....	.....	.....
Coutts, Alta.....	677	27	5,265	79,273	6	.....	.....	.....	.....
Twin Lakes.....	235	4	25	.....	.....	.....	.....	.....	.....
Gateway, B.C....	235	21	7	.....	10	.....	.....	.....	.....
Kingsgate, B.C.	1,667	69	172	4,729	.....	.....	.....	.....	.....
Nelson, B.C.....	26	2	21	.....	.....	.....	.....	.....	.....
Rykerts, B.C.....	25	.....	.....	.....	.....	.....	.....	.....	.....
Rossland, B.C.....	65	.....	56	476	.....	.....	.....	.....	.....
Grand Forks, B.C.....	167	7	315	400	61	2	.....	.....	.....
Midway, B.C..... ...	102	.....	28	3,102	.....	.....	.....	.....	.....
Myncaster, B.C.....	40	.....	1	.....	.....	.....	.....	.....	.....
Bridesville, B.C.....	126	4	38	.....	.....	.....	.....	.....	.....
Keremeos, B.C.....	103	2	3	162	1	.....	.....	.....	.....
Osoyoos, B.C.	416	12	48	185	.....	.....	.....	.....	.....
Huntingdon, B.C.....	693	29	139	7,018	8	665	2	.....	.....
New Westminster, B.C..	.....	.....	9	.....	.....	.....	.....	.....	.....
White Rock, B.C.....	932	11	56	25,792	3	8	6	5	.....
*Vancouver, B.C.....	204	12	20	28,224	.....	58	1	2	.....
Victoria, B.C.....	125	1	28	845	.....	8	.....	.....	.....
White Horse, Y.T.....	108	.....	854	417	94	.....	.....	.....	.....
Yukon General..... ...	13	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	29,726	1,641	14,747	213,332	374	822	22	8	5

[1] Russian Sables..2. * 8 peccaries.

IMPORT INSPECTIONS FROM EUROPE AND ELSEWHERE.

Port.	Horses.	Mules.	Cattle.	Sheep.	Swine.	Goats.	Deer.	Asses.
Sydney, N.S.....	.....	1	.....	.....	.....	.....	.....	.....
St. John, N.B....	241	.....	2	8	9	.....	.....	.....
Quebec, Que.....	11	.....	237	458	29	1	2	.....
Montreal, Que.....	769	.....	.....	.....	.....	.....	.....	5
Athelstan, Que.....	1	.....	.....	.....	.....	.....	.....	.....
Prescott, Ont.....	12	.....	.....	.....	.....	.....	.....	.....
Niagara Falls, Ont	5	.....	2	.....	.....	.....	.....	.....
Bridgeburg, Ont	54	.....	1	27	1	.....	.....	.....
	1,093	1	242	493	39	1	2	5

DISEASED IMPORTS.

Port.	No. of Horses in Infected Shipments.	No. of Shipments.	No. of Horses Diseased.	Country of Origin.	Action.
Aroostook Junction, N.B	2	1	1	U. S.	Returned.
Morrisburg, Ont	7	1	1	"	"
Kingston, Ont	2	1	1	"	"
Gretna, Man	17	3	3	"	"
Snowflake, Man	16	1	1	"	"
Bannerman, Man	11	2	2	"	"
North Portal, Sask	122	28	34	"	"
Northgate, Sask	8	1	1	"	"
Marienthal, Sask	18	2	2	"	"
Wood Mountain, Sask	23	2	3	"	"
Big Muddy, Sask	17	4	4	"	"
Coutts, Alta	8	4	4	"	"
Kingsgate, B.C	2	1	1	"	"
Grand Forks, B.C	1	1	1	"	"
Bridesville, B.C	2	1	1	"	"
[2]Osoyoos, B.C	61	5	18	"	"
Huntingdon, B.C	2	1	1	"	"
Victoria, B.C	13	1	1	"	"
	332	60	80		

[1] 402 sheep in one shipment rejected, 3 being affected with sheep scab.

[2] Two horses rejected for mange.

[3] Four horses in one shipment rejected, 1 being affected with dourine. Affected animal destroyed.

At Abercorn, Que., 1 cow was rejected and destroyed, being affected with tuberculosis.

At White Rock, B.C., 1 cow was rejected, being affected with tuberculosis.

PURE-BRED IMPORTS.

Horses.

Breed.	Great Britain.	United States.	Elsewhere.	Total.
Belgian		14	38	52
Clydesdale	437	4		441
French Coach	2	3		5
German Coach		1		1
Hackney	57	2		59
Highland	1			1
Hunter	6			6
Percheron	3	89	133	225
Polo Pony	8			8
Ponies	156			156
Shetland	178	10		188
Shire	30			30
Standard bred		94		94
Suffolk	6			6
Thoroughbred	5	4		9
Trotting bred		3		3
Welsh	23			23
	912	224	171	1,307

CATTLE.

Breed.	Great Britain.	United States.	Total.
Ayrshire	105	12	117
Durham	1	2	3
Galloway	13		13
Guernsey	5	9	14
Hereford		22	22
Holstein		31	31
Jersey	40	24	64
Polled Angus	4	16	20
Red Polled		28	28
Shetland	5		5
Shorthorn	67	30	97
West Highland	3		3
	243	174	417

SWINE.

Breed.	Great Britain	United States.	Total.
Berkshire	27	2	29
Chester White		14	14
Duroc Jersey		17	17
Hampshire		1	1
Lincoln Curly Coated	1		1
Poland China		28	28
Yorkshire	11		11
	39	62	101

SHEEP.

Breed.	Great Britain.	United States.	Total.
Cheviot	43	5	48
Cotswold	14		14
Dorset	111		111
Hampshire	75	38	113
Karakul		22	22
Leicester	37	7	44
Lincoln	1		1
Oxford	37	7	44
Persian		1	1
Rambouillet		1	1
Shropshire	126		126
Southdown	47		47
Suffolk	2		2
	493	81	574

GOATS.

Breed.	Uuited States.
Angora	7
Swiss	2
	9

ANIMALS INSPECTED FOR EXPORT.

Port.	Horses.	Mules.	Cattle.	Sheep.	Swine.	Buffalo.
St. John to Great Britain	1			500		
Montreal to Great Britain	127		432			2
Toronto to Great Britain			7,409			
Bridgeburg to Great Britain			506			
Montreal to Great Britain via Boston			776			
Charlottetown to United States	1					
Halifax to United States	6					
Toronto to United States			83,819			
St. John to South Africa	15	75				
Quebec to South Africa				80		
Montreal to South Africa	7	177	31	296		
Charlottetown to Newfoundland	53		1,420	827	96	
Summerside to Newfoundland	1		216	383	1	
Baythell to Newfoundland	22		147	36		
Mulgrave to Newfoundland	22		402	172	2	
Sydney to Newfoundland	140		1,240	649	146	
Toronto to Newfoundland			31			
Sydney to St. Pierre and Miquelon	1		122	208	24	
Halifax to St. Pierre and Miquelon			14		14	
Halifax to Bermuda	17		30		14	
Toronto to Bermuda			286			
Halifax to Jamaica			2	33		
Montreal to New Zealand			51			
Vancouver to New Zealand	7					
	420	252	96,934	3,184	297	2

EXPORT ANIMALS REJECTED AT THE FOLLOWING PORTS.

Port.	Cattle.
Montreal	8
Toronto	31
	39

STAFF.

Several changes have taken place in the personnel of the staff, the increase of work necessitating the appointment of additional inspectors, and the filling of places rendered vacant by deaths and resignations.

APPOINTMENTS.

Veterinary Inspectors.

G. R. Brewster, V.S.,
H. L. Cass, V.S.,
G. C. Cockerton, V.S.,
C. H. Drake, V.S.,
J. J. Farrell, V.S.,
R. Gilmour, V.S.,
W. A. Hilliard, V.S.,
G. Hoey, V.S.,
A. Hobbs, V.S.,
J. T. M. Hughes, M.R.C.V.S., (re-appointed).
G. S. Jermyn, V.S.,
J. Lee, V.S.,
R. W. MacDonald, V.S.,
W. F. Macdougall, V.S.,
W. D. MacCormick, V.S.,
D. H. McFadden, V.S.,
A. R. Munroe, V.S.,
A. Moore, V.S.,
I. Pasley, V.S.

Inspectors.

R. DeCock,
H. DeCock,
A. Hoey,
G. Holmes,
M. Rodgers,
J. Temple,
C. A. Waterman,
J. J. Marshall.

Clerks (Outside).

W. Morse,
Miss L. Cook.

TRANSFERS.

D. R. Bone, V.S. (to Meat Inspection Division).

RESIGNATIONS.

Veterinary Inspectors.

D. Coristine, V.S.,
R. B. Coutts, V.S.,
C. H. Drake, V.S.,
C. Head, V.S.,
G. Hoey, V.S.,
H. S. Manhard V.S.,
R. D. McIntosh,
P. R. Talbot, V.S.

Inspectors.

H. Bull,
E. N. Macduffee.
R. DeCock,
J. C. Dafoe,

Clerks (Outside).

F. Smith,
Miss B. Creswell.

SERVICES DISPENSED WITH.

Inspectors.

A. Duck,
H. Currie,
C. Evans,
H. M. McNaughton,
E. Noble,
Thos. Scott,

MEAT AND CANNED FOODS DIVISION.

The administration of the "Meat and Canned Foods Act" is placed in the hands of the Veterinary Director General, and is under the supervision of Dr. Barnes, whose report is printed herewith. The development of the meat trade has rendered necessary some increase in our staff, and we have been fortunate in securing the services of men well qualified for this technical work. The value of our examination of candidates for appointment is amply demonstrated, and I wish such an examination could be extended to include lay inspectors as well as veterinary.

STATISTICS.

Chief, Meat and Canned Foods Division	R. Barnes, V.S.
Travelling Inspector	H. H. Ross, V.S.
Chief Inspector of Canneries	C. S. McGillivray.
Canning Inspectors	W. A. D. Graham. A. Bowlby. H. St. J. Switzer.
Inspector of Condensed Milk Factories	F. W. Baumgartner.
In charge of Toronto	L. A. Willson, V.S.
In charge of Montreal	M. J. Kellam, V.S.
In charge of Winnipeg	C. D. McGilvray, M.D.V.
In charge of Prince Edward Island	W. H. Pethick, V.S.
Special duty at Biological Laboratory, Ottawa	J. C. Reid, M.V.
Special duty at Biological Laboratory, Lethbridge	W. A. Hilliard, D.V.S.
Transferred temporarily to Field Work	J. H. Shonyo, V.S. H. Pomfret, V.S.
On Transfer	A. C. Tanner, V.S.
Leave of Absence	A. J. G. Hood, M.V. A. C. Lundie, V.S. J. H. Pringle, M.R.C. V.S.
Sick Leave	W. R. Monroe, V.S. F. A. Daigneault, M.V. W. J. Blainey.

ADDITIONS TO STAFF.

Veterinary Inspectors.	Lay Inspectors.	Canning Inspectors.
C. J. Bousfield, V.S.	C. Brind, V.S.	A. H. Hobbs (temporary.)
H. B. Collett, V.S.	H. W. Mallett.	
K. L. Douglas, V.S.	J. H. Mumford.	
J. W. Fisher, V.S.	H. Newton.	
E. C. Gauvin, M.V.	J. T. Newton.	
J. G. Jervis, B.V. Sc.	C. E. Smith.	
S. T. Law, V.S	W. G. Williams.	
A. G. Murray, V.S.	John Wright.	
C. W. McIntosh, V.S.		
L. H. Swail, V.S.		
J. A. Théoret, D.V.S.		
D. E. Tulloch, M.R.C.V.S.		

TRANSFERS.

W. D. MacCormack, V.S.
A. R. Monroe, V.S.

DEATHS.

M. W. Everett.

RESIGNATIONS.

S. T. Law, V.S.
M. H. Milton, V.S.
C. E. Edgett, V.S.

PROLONGED LEAVE OF ABSENCE.

A. C. Lundie, V.S.
A. J. G. Hood, M.V.
R. E. Murray, V.S.
W. R. Monroe, V.S.
J. H. Pringle, M.R.C.V.S.

DISMISSALS.

R. E. Murray, V.S.

ESTABLISHMENTS UNDER INSPECTION MARCH 31, 1914.

No.	Name.	Place.	Inspectors.
1	Fowler's Canadian Co., Ltd	Hamilton	A. C. Ramsay, V.S. H. Garrett, B.V.S. J. E. A. Duhamel, M.V. J. Wright.
2E	Matthews-Blackwell, Ltd.	Brantford	W. Kime, V.S. J. G. Davidson, V.S.
2C	" " "	Peterborough	W. A. Henderson, V.S. W. Tennant, V.S.
10	F. W. Fearman Co., Ltd	Hamilton	C. J. Johannes, V.S. C. S. Cain, V.S. W. A. Morrin, V.S.
11	Ingersoll Packing Co	Ingersoll	R. D. Orr, V.S C. L. Wallace, V.S. J. O. Guertin, M.V.
13	Whyte Packing Co., Ltd.	Stratford	T. M. Pine, V.S. A. W. Beach, V.S.
16	Dominion Abattoir Limited	London	W. R. Bell, V.S.
17	Jones Packing and Provision Co., Ltd	Smith's Falls	J. B. White, V.S.
31	O'Keefe & Drew Abattoir	Chatham	J. R. Thompson, V.S. A. A. H. Carley, V.S.
2E	Matthews-Blackwell, Ltd.	Toronto	F. A. Walsh, V.S. F. A. McNally, V.S. G. C. Brownridge, V.S. J. R. Songhurst. J. T. Newton.
4A	Wm. Davies Co., Ltd	"	A. R. Torrie, VS. C. J. Bousfield, V.S. W. Lawson, V.S. E. R. Farewell, V.S. E. C. Gauvin, M.V. J. A. Hodgins. W. McCabe. E. E. White.
7	Harris Abattoir Co., Ltd., St. Clair Ave.	West Toronto	R. H. Cook, V.S. A. G. Murray, V.S. D. R. Bone, V.S. J. E. Morse, V.S. J. H. George, V.S. E. Cox. W. Howard. P. Kingston.
7A	Harris Abattoir Co., Ltd., Strachan Ave.	Toronto	D. A. Irvine, V.S. D. Brown.
9	Gunns Limited	"	D. C. Tennent, V.S. F. L. Wingate, V.S. J. E. Bennett, V.S. J. H. Mumford. P. Kelly.
18C	Swift Canadian Co., Ltd.	"	F. H. S. Lowrey, V.S. A. C. Walker, V.S. W. J. Pedden, V.S. T. W. R. Macfarlane, V.S. H. D. Nelson, V.S. A. A. Belanger, M.V. H. Newton. E. Hunter. C. Brittain.
28	W. Wight & Co.	"	F. Fisher, V.S.
2A	Matthews-Blackwell, Ltd	Hull, P.Q.	W. Moynihan, B.V.Sc. J. Langevin, M.V. A. W. Younghusband, V.S. J. Terrance.
21	" " "	Montreal	J. W. Symes, D.V.S. C. H. Weaver, B.V.Sc. O. Brunet, M.V. G.W. Walsh. H. Beaudoin.

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ESTABLISHMENTS UNDER INSPECTION MARCH 31, 1914—*Concluded.*

No.	Name.	Place.	Inspectors.
4B	Wm. Davies Co., Ltd	Montreal	A. R. Douglas, D.V.S. W. H. James, V.S. R. D. Boast, V.S. K. L. Douglas, V.S. J. R. Young. R. Benoit.
22	Montreal Union Abattoir	"	C. E. Deroine, M.V. S. Jaques, V.S. C. D. Bancroft, D.V.S. N. E. McEwen, B.V.Sc. J. N. L. Couture, M.V. N. W. Reid, M.V. E. Lallemand.
24	Wm. Clark, Limited	"	E. G. Lemieux, M.V. D. McDonald.
25	Montreal Abattoirs, Limited	"	E. Dufresne, MV. J. W. Fisher, V.S. C. W. McIntosh, V.S. J. F. Campeau, M.V. L. J. Demers, M.D., M.V. F. Maccabee.
29	N. K. Fairbank Co., Ltd	"	H. Mizener.
47	Société S. P. A	"	H. Macey.
18	Swift Canadian Co., Ltd	Winnipeg	J. D. Ross, V.S. F. C. Bishop, V.S. C. Brind, V.S. W. G. Williams.
19	Gordon, Ironside & Fares	"	F. C. Jones, V.S. J. L. Trudeau, M.V. H. Colébourn, V.S. R. H. Lyon.
20	Gallagher, Holman & Lafrance	"	A. R. Walsh, V.S. H. J. Elliott, M.D.V. C. H. Johnston.
21	Western Packing Co	"	J. R. N. Harrison, V.S. R. B. Dellert, V.S.
18 B	Swift Canadian Co., Ltd	Edmonton	J. R. English, D.V.S. J. H. Tupling, B.V.Sc. G. Whitehead, V.S.
23 A	P. Burns & Co., Ltd	"	I. Christian, V.S. L. H. Swail, V.S. C. S. Anderson, V.S.
23	"	Calgary	J. A. McLeish, V.S. D. E. Tulloch, M.R.C.V.S. H. B. Collet, V.S. T. G. McClelland. C. E. Smith.
19 B	Gordon, Ironside & Fares	Moosejaw	J. W. Purdy, V.S. S. G. Bright, V.S. J. A. Théoret, M.V.
23 B	P. Burns & Co., Ltd	Vancouver, B.C.	E. A. Bruce, V.S. J. Dickinson, B.V. Sc. J. G. Jervis, B.V. Sc. H. W. Mallett.
50	Davis & Fraser	Charlottetown, P.E.I.	T. H. Richards, V.S.

The following establishments have been under inspection temporarily between April 1, 1913, and March 31, 1914 :—

No.	Name.	Place.
12	P.E.I. Railway	Kensington, P.E.I.
15	John Roop	Charlottetown, P.E.I
26	Railway Freight Shed,	Kerrobert, Sask.
34	Sussex Packing Co.	Sussex, N.B.
35	N.B. Cold Storage	St. John, N.B.
36	W. A. Leard	Charlottetown, P.E.I.
36b	W. A. Leard	Summe side, P.E.I.
37	Railway Freight Shed	York, P.E.I.
40	Aylmer Canning Co.	Aylmer, Ont.
41	P.E.I. Railway	Bradalbane, P.E.I.
42	P.E.I. Railway	Montague, P.E.I.
46	R. E. Mutch & Co.	Charlottetown, P.E.I.
48	Heber Hartlen	Halifax, N.S.
51	J. H. Myrick & Co	Tignish, P.E.I.
53	P.E.I. Railway	Summerside, P.E.I.
57	P. McNutt & Son	Malpèque, P.E.I.
58	J. R. Doucette	Waterford, P.E.I.
60	Fred Magee	Port Elgin, N.B.
61	W S. Fraser	Peter's Road, P.E.I.
64	P. C. Gallant	Summerside, P.E.I.
65	Thomas Butler	Murray River, P.E.I.
66	John Munn	Murray River, P.E.I.

SESSIONAL PAPER No. 15b

DISEASES FOUND AT ESTABLISHMENTS UNDER INSPECTION.

Diseases.	Cattle.			Sheep.			Swine.			Poultry.
	Carcases.	Portions.	Lbs.	Carcases.	Portions.	Lbs.	Carcases.	Portions.	Lbs.	Lbs.
Abscess	13	28,960		15	268		12	2,284		
Actinomycosis	17	13,290			4		5	514		
Adhesions		5,306			241			3,483		
Adeno							1			
Ascitis				1			1			
Arthritis				1			1	4		
Angiomatosis		1,866								
Bruises	342	17,159	4,201	27	876	1,334	46	8,803	41,854	
Carcinoma				4			6			
Cripples	11	155		10	38		29	5,963		
Cysts		654						159		
Cysticercus Ovis				1	20					
" Bovis	263	268								
" Cellulosae							217	94		
" Tenuicollis				6	287					
Congestion		55			12			226		
Cirrhosis		9						25		
Decomposed	9	85	106,003			18,518	1		39,663	
Dirty		7	474,852		9	270		22	12,712	
Emaciation	192			81			25			
Enteritis	5			8			39			
Endo-Carditis	1									
Emphysemia		1					3	601		
Frozen								125		
Hernia		3					4	81		
Hepatitis				1			1			
Hydraemia	15			3			1			
Hydremic cachexia							1			
Hydromata				1						
Hypertrophy		4			1			6		
Hog cholera							243			
Immaturity	3,167									
Improper bleeding	10			13			78	23		
Inflammation	9			4			20	2		
Icterus	6			10			22			
Induration		109						13		
Metritis	19			9			19			
Mucoid degeneration	41									
Mammitis	2	13			1		1	50		
Mastitis				1						
Melanosis	4	2						2		
Necrosis	1	304			309			31,463		
Nephritis	11			1			4			
Parturition				2			3			
Parasites		30,674		2	103,935		1	30,770		
Pericarditis	45			3			7			
Peritonitis	38			8			63			
Pleuritis	7			8			52			
Proctitis							4			
Pneumomycosis					141					
Pneumonia	118			92			268			
Pyaemia or septicaemia	182			66			392			
Sexual smell							153	331		
Skin disease							1	199		
Sarcoma	14						3			
Sapremia							1			
Sour		45	135,747			2,552	1		77,808	
Septic infection	109						5			
Tuberculosis	2,488	20,334					2,240	435,333		
Tuberculosis pseudo				5	27					
Tumours	11	81		2	1		7	11		
Uraemia	2						3			
Unmarked			233			427		126	53	
Various	25	358	120	14	104		23	384	695	357
Damaged by fire			120						400	
Total	7,177	119,742	722,743	399	106,274	23,101	4,007	521,097	173,185	357 and 407 carcases.
Found dead	118			226			1,321			

The following summary shows the results of post mortem inspections of Cattle, Sheep and Swine from April 1, 1913 to March 31, 1914.

Cattle marked "Canada approved"	524,817
Carcases of cattle "condemned"	7,177
Percentage of cattle "condemned"	1.35
Portions of cattle "condemned"	119,742
Sheep marked "Canada approved"	498,885
Carcases of sheep "condemned"	399
Percentage of sheep "condemned"	.08
Portions of sheep "condemned"	106,274
Swine marked "Canada approved"	1,795,053
Carcases of swine "condemned"	4,007
Percentage of swine "condemned"	.22
Portions of swine "condemned"	521,097
Total number of carcases "passed"	2,818,755
Total number of carcases "condemned"	11,583
Percentage of carcases "condemned"	.41
Total number of portions "condemned"	747,113

In addition to the animals slaughtered at inspected establishments, the following amounts of dressed and cured meats and lard, etc., were received during the fiscal year from the United States and Australasia:—

	Pounds.
Beef	7,282,345
Mutton	1,665,100
Pork	5,627,353
Lard	1,914,555
Miscellaneous	3,413,861

During the course of reinspection the following meats were condemned:—

—	Cattle.	Sheep.	Swine.	Poultry.
	Lbs.	Lbs.	Lbs.	Lbs.
Sour	135,747	2,552	77,808	.....
Dirty	474,852	270	12,712	.....
Bruised	4,211	1,334	41,854	.....
Decomposed	106,003	18,518	39,663	.....
Damaged by fire	120	.....	400	.....
Unmarked	233	427	53	.....
Various	1,577	.....	695	357
	722,743	23,101	173,185	357

Total amount condemned on reinspection, 919,386 pounds.

CAR AND YARD INSPECTION.

Railways are obliged, under the regulations, to maintain stock yards and stock cars in a clean sanitary condition, and to disinfect them at frequent intervals. A sufficient number of inspectors is engaged in seeing that this work is efficiently and thoroughly done as the importance of this work can hardly be overestimated. Infected cars and yards are very dangerous means of spreading disease and constant watchfulness is necessary to avoid trouble from this source. I am glad to report that this part of our service is carried out satisfactorily by our officers and that the railways appear to realize its importance by their willingness to do whatever is required.

I have the honour to be, sir,

Your obedient servant,

F. TORRANCE,
Veterinary Director General.

Hon. MARTIN BURRELL,
Minister of Agriculture.

APPENDIX No. 1.

(G. Hilton, V.S., Chief Veterinary Inspector.)

OTTAWA, March 31, 1914.

SIR,—In submitting my report for year ending March 31, 1914, I would say that my duties during this period have been of an executive nature at headquarters.

I, however, attended the seventeenth annual meeting of the United States Live Stock Sanitary Association, in Chicago, during the first week in December, and read a paper on the Control of Hog Cholera by slaughter methods.

I have the honour to be, sir,

Your obedient servant,

GEORGE HILTON,
Chief Veterinary Inspector.

APPENDIX No. 2.

(R. Barnes, V.S., Chief Meat Inspection Division.)

OTTAWA, March 31, 1914.

SIR,—I have the honour to submit my annual report for the year ending March 31, 1914.

The work of this division has steadily increased during the year, not only in volume but in efficiency.

Instructions have been given to our inspectors regarding the handling and the methods of preparation of various meats and meat food products, and the technical inspection of such articles, with beneficial results.

Improvement has been marked in the sanitary conditions of establishments under inspection. Changes and alterations have been made, the materials used being of a non-absorbent nature, which will be a big factor in keeping such plants in a clean and satisfactory condition.

During the year there was completed and put into operation in Toronto one of the largest packing plants in Canada. This factory is modern in structure and equipment, and is a credit to its owners and to the Dominion.

On April 22, the annual examination was held throughout Canada. Forty-six candidates presented themselves, of whom thirty-three were successful in passing.

During the year a number of additions were made to the staff, both in veterinary and lay inspectors. This was made necessary by the bringing under inspection of the large plant of the P. Burns Company at Edmonton, and the smaller establishment of the Dominion Abattoir Co., Ltd., London, Ont., together with a gradual strengthening of the entire staff throughout the Dominion; yet, with these additions, the service is at the present time no more than able to meet the demands and maintain an efficient inspection.

To do this it is still necessary during the heavy killings in the fall for your inspectors to be called upon to work overtime. This they have done with little complaint, but to this cause may be ascribed in many instances the somewhat unusual amount of sickness which occurs amongst them during the winter months.

In the early fall, owing to the removal of the duty on imported meats by the United States, the larger establishments at once began exporting meats and meat food products, more particularly beef, on a large scale. This immediately increased the price paid to the producer for this class of meat food, which was no doubt appreciated and taken full advantage of, yet it has certainly decreased the supply in Canada of this already limited article of food. To this cause principally may be attributed the increase in the number of animals slaughtered, which shows an excess over the previous fiscal year, as follows:—

—	Total Killings.	Increase over previous year.
Cattle	531,994	81,614
Sheep	4 9,284	43,6 7
Swine	1,799,960	191,319

The increases or decreases in the killings in each province are shown to be as follows:—

—	Cattle.	Sheep.	Swine.
Ontario	+ 29,212	+ 3,285	− 98,410
Quebec	+ 43,223	− 4,101	− 46,483
Manitoba	− 13,321	− 7,000	+ 85,626
Alberta	+ 1,379	+ 15,109	+ 158,337
Saskatchewan	+ 372	+ 3,014	+ 32,556
British Columbia	+ 19,727	+ 40,967	+ 61,025
Prince Edward Island	+ 1,012	− 7,637	− 1,332

+ Increase. − Decrease.

The percentage of increases in killings is as follows:—

Cattle slaughtering increased 18 per cent over 1913.
Sheep " " 9 per cent over 1913.
Swine " " 12 per cent over 1913.

The calves killed represent 21 per cent of total cattle killed, and have about the same ratio of increase as cattle, 18 per cent over 1913.

Hogs—Eastern Canada, decrease 10 per cent.
" Western Canada, increase 146 per cent.

The percentage of slaughter for each province to the total kill for all Canada is:—

—	Cattle.	Sheep.	Swine.
	Per cent.	Per cent.	Per cent.
Ontario	38	30	49
Quebec	38	30	18
Manitoba	10	10	12
Alberta	8	13	13
Saskatchewan	1	2	2
British Columbia	5	10	4
Prince Edward Island	.....	4	1

From the above you will notice the large increase in the slaughter of hogs in Western Canada over the preceding year. In 1912 the percentage of slaughter to the total kill for all Canada was 7 per cent; in 1913, 14 per cent, and in 1914, 31 per cent.

CATTLE CARCASES CONDEMNED.

The greater part of the increase of carcases condemned is due to condemnations of calves for immaturity. It is to be regretted that owners and feeders persist in sending this class of animals to market in an immature and unfinished condition rather than keep them for a few weeks or months, during which time they may be grown into a palatable and wholesome food, and thereby relieve the shortage of meat foods.

Increases are also shown in the condemnations for tuberculosis, bruises, emaciation, and cysticercus bovis. Of the first-named disease it must be expected that the condemnations will increase until some definite measures are adopted for its control.

The success of any legislation in this direction will, to a large extent, be dependent upon the co-operation of the owners of affected animals and the demand from the general public that they be protected from this source of infection. While the latter are becoming alive to the danger, and are voicing their requests through Health Boards, the former have been, up to the present, by no means aggressive, and are scarcely sympathetic in the movement, being undoubtedly influenced by the financial side of the question rather than by its effect upon human health.

The number of carcases and portions annually destroyed on account of bruises represents an unwarranted condition which exists in connection with the handling and transportation of meat food animals. With the exercise of reasonable care, many of the bruises could be prevented and thousands of pounds of meat saved for human food.

Emaciation is found almost entirely among the poorer, or what is known as "canner", cattle. Owing to the extraordinary demand for this class of meat during the fall of 1913 this naturally increased the number condemned.

Cysticercus (tape worm cysts) is found in cattle and hogs from Western Canada, but is rarely seen in animals bred and raised in the East. A more complete method of examination for these cysts was inaugurated during the year which has, perhaps, been a factor in the detection of an increased number of animals affected, with a corresponding increase in the condemnations.

SWINE.

An increase in the number of carcases of swine condemned during the year may be attributed to the spread of tuberculosis and hog cholera.

Taking into consideration the increased slaughter of these animals, the number of portions condemned is about normal, except in the case of those showing bruises, where it is largely in excess of previous years. This is no doubt due to rough handling during transit.

The swine "found dead" are greatly in excess of last year, and can safely be attributed to overloading of cars.

The increased number of requests for information regarding the operation of the Act and Regulations is encouraging, and indicates that a lively interest is being taken in the safeguarding of the wholesomeness of our meat foods.

A number of applications for inspection have been received which could not be granted owing to the fact that the meat was intended for local consumption, and therefore did not come within the jurisdiction of the Act.

A modern municipal abattoir is under construction in Toronto which, when completed, will be a credit to that city. This will be the first public abattoir owned and operated by a municipality in the Dominion of Canada, and is a splendid tribute to the progressive and enterprising spirit of the citizens. This establishment will supply a long-felt want and, should it receive the loyal support which it deserves, coupled with efficient and careful management, its success is assured.

Prices for all classes of meat-food animals have been good, and should have returned to the feeder and producer a good profit on the capital invested and ample remuneration for the labour involved.

FRUIT VEGETABLES AND MILK.

The work in connection with the supervision of establishments engaged in the manufacture of this class of foods has been carried on with very little friction. The plants are well kept, and manufacturers have endeavoured to observe the requirements of the regulations, with the result that unclean and unsatisfactory premises will soon be a thing of the past.

Considerable progress has been made in the proper marking and labelling of these products. Owing to the absence for so many years of standards governing the manufacture, many packers have adopted descriptions of the contents of packages which could not be said to be true and correct.

During the year the Department of Inland Revenue added to the standards already in force a new section dealing with the labelling of jam mixtures. This new section defines more clearly the necessary marking of such mixtures. This is amply justified, as the old standards permitted manufacturers to evade the spirit of the standards inasmuch as the label did not convey to the purchaser the proportionate ingredients which made up the finished product. Owing to the large number of labels on hand which were affected by this new section, we have not made such progress as we would wish, yet by continuing the present effort it is hoped to bring all into conformity during the coming year.

We have insisted that the presence of glucose be shown on the labels, as required by the standards. This requirement is being fairly well met.

While I am not at all anxious to take legal action, it may be necessary in some isolated cases to do so where the packer continues his indifference to our requirements.

A decided improvement is noticed in plants engaged in evaporating apples, also in their products, yet much remains to be done, especially in connection with the moisture content of the apples, which is fixed by law at 27 per cent, and from present information is, in my opinion, too high. Samples of apples, stock, and waste have been taken and will be tested for water-content and examined as to quality. With your permission, samples will again be taken next year and examined in the same manner. The information thus compiled will be the first of its kind obtained in Canada, and if the results of the two years' tests are such as we anticipate, it might not be out of place for me to suggest that a bulletin be issued dealing with this important subject in the hope that the information thus secured may be taken advantage of and result in an improvement in the methods of preparing and handling this class of food.

The work of the inspectors whose duty it is to look after this particular line of food has been generally satisfactory.

CONDENSED MILK.

Nothing of particular importance has developed in connection with the inspection of this food. The strict sanitary methods adopted in regard to its manufacture ensure to the purchaser a healthful, nourishing food at a minimum cost.

I desire to thank not only the members of the office staff but also the veterinary and lay inspectors on duty at the different establishments throughout the Dominion for their hearty co-operation in carrying out the requirements of the work. The chief travelling inspectors have been especially attentive to their duties and have, at considerable personal discomfort, readily undertaken the many difficult and sometimes annoying tasks assigned to them.

I have the honour to be, sir,

Your obedient servant,

ROBT. BARNES,
Chief, Meat and Canned Foods Division.

APPENDIX No. 3.

(A. E. Moore, D.V.S., Chief Travelling Inspector.)

OTTAWA, March 31, 1914.

SIR,—I have the honour to submit herewith my annual report for the year ending March 31, 1914.

During the year I have interviewed many of the field inspectors at their headquarters, for the purpose of consulting them and enlightening them on various subjects pertaining to their work.

I have also visited at different times nearly all the quarantine stations and inspection ports in Eastern Canada. I have especially endeavoured to impress on the officers in charge of the quarantine stations the importance of keeping the Government property scrupulously clean and thoroughly disinfected at all times, and I am pleased to say that there is a marked improvement in this respect.

In January, according to your instructions, I visited Saskatchewan to consult with Inspector Tamblyn with reference to the work in that province, and especially with regard to the hog cholera situation.

I personally met nearly all the inspectors of the province, and carefully instructed them in the method of handling and diagnosing hog cholera, and am convinced that they are now all as capable of dealing with the disease as the other inspectors of the Dominion. I advised some changes in placing the inspectors in the field, so as to enable them to accomplish their work to better advantage, and without unnecessary loss of time.

GLANDERS.

I am pleased to say that personally I have not seen any glanders this year. I have tested with mallein twenty-two suspects, however, but with negative results, suspicion being due to various disorders somewhat resembling glanders.

TUBERCULOSIS.

Assisted by Inspectors Marriott and Hall, I have tested five hundred and ninety-three (593) cattle on seven different premises, sixty-seven (67) reacted, and seven were considered suspicious. These cattle are under the direct supervision of this branch.

TESTING FOR EXPORT TO THE UNITED STATES AND OTHER COUNTRIES.

I have tested 122 cattle for export to the United States on eleven different premises and obtained only one reaction. I have also tested thirteen cattle for export to New Zealand, two of which reacted, and sixty-seven cattle for Western Canada, and obtained two reactions.

During the year I have applied the intradermal test to about two hundred cattle, with results which correspond fairly well with the subcutaneous test. I believe that this method of testing will prove of great assistance, especially in doubtful subcutaneous tests, and in animals advanced in pregnancy, or presenting other conditions which might cause a fluctuating temperature. The great advantage of this method is that it may be applied under any conditions, and to very young calves. The results are more difficult to arrive at than the subcutaneous method, and requires considerable experience before an inspector becomes an expert.

HOG CHOLERA.

There have been several outbreaks of hog cholera in eastern Canada this year which might have become serious had it not been for the prompt attention of the inspector. Fortunately, we have been able in most cases to prevent the inspection from spreading.

As in former years, the origin of many of the outbreaks of hog cholera has been the feeding of hotel garbage. These garbage-fed hogs are always in large lots, and consequently the losses are heavy. The practice of feeding this material should be prohibited.

As I have many times previously reported, not only do these outbreaks create new hog cholera centres all over the Dominion, but the hogs are kept in indescribable filth, and fed on material containing every conceivable thing in the way of animal and vegetable refuse, and in all stages of decomposition.

The people who collect and feed this garbage are usually foreigners, Italians, Swedes, etc., or irresponsible persons who have no regard whatever for cleanliness or sanitary surroundings.

I have instructed all the Inspectors who have their headquarters in cities to make periodic inspections of all the garbage-fed hogs in their surrounding districts, to warn the owners as to the danger of feeding this material, and to inform them that the department may withhold compensation should their hogs develop hog cholera.

This inspection has been done at spare times, and a great many places have been visited.

The most serious outbreak of hog cholera which happened this year originated in hogs belonging to a large breeder in the Province of Quebec The disease developed soon after his return from the exhibitions.

As this breeder made numerous sales, and as his breeding hogs were in contact with many others, a large number of pure-bred hogs were consequently involved. The disease spread to twenty-six farms, and it was necessary to destroy all the hogs on these farms. Before the disease was finally eradicated, we were obliged to quarantine a large number of others, as they were indirect contacts. Fortunately, my personal knowledge of that part of the country enabled us to check the spread of the disease even far sooner than I expected.

I have also investigated several reports of suspected hog cholera in different parts of the country but found conditions usually due to improper feeding and unhealthy surroundings.

MANGE IN HORSES.

Several outbreaks of mange in horses were dealt with in Ottawa, and in the Counties of Carleton and Russell.

INSPECTION OF IMPORT HORSES.

During the year I have tested five horses imported from the United States, and which were entered on two different dates.

I am pleased to state that I have not seen a case of rabies, sheep scab, or anthrax during the year.

I have investigated several reported cases of the above diseases, but found other conditions in every case.

I have the honour to be, sir,

Your obedient servant,

A. E. MOORE,
Chief Travelling Inspector.

APPENDIX No. 4.

(C. D. McGilvray, M.D.V., Inspector in charge, Manitoba.)

WINNIPEG, Man., March 31, 1914.

SIR,—I have the honour to submit herewith report in connection with the Health of Animals in the province of Manitoba for the year ending March 31, 1914.

The work of the branch here, during this period, has consisted in the carrying out of the various regulations and requirements of the Animal Contagious Diseases Act relating to animal quarantine and the control of diseases, as well also as that of the Meat and Canned Foods Act and the various regulations relating thereto.

DISEASES OF ANIMALS CONTROL.

The services of the officers detailed to this branch of the work have consisted chiefly in dealing with the control and eradication of such diseases affecting animals encountered here, as are scheduled under the Animal Contagious Diseases Act.

The diseases dealt with have included glanders, hog cholera, mange of horses, mange of cattle, sheep scab, suspected dourine, and tuberculosis.

Investigations have also been made of such other diseases and conditions affecting animals as appeared of sufficient importance and to be deserving of consideration and attention.

GLANDERS

The control and eradication of glanders in the province of Manitoba is, I am pleased to report, making satisfactory progress. The decrease in the number of outbreaks and animals found to be affected is still being maintained, indicating that the ultimate eradication of this disease is possible under the policy and measures by means of which glanders is dealt with in Canada.

Glanders Statistics for Manitoba.

The following summary shows the number of horses tested with mallein and destroyed for glanders during the year extending from April 1, 1913, to March 31, 1914:—

Horses submitted to the mallein test—

First test	212
Second test	12

Horses found to react and destroyed for glanders—

To a first test	18

Of this number six were clinical cases.

Total compensation allowed, $1,780, being an average of $98.89 per animal.

Import horses tested at destination—

First test	35
Second test	1

Destroyed for glanders without compensation—
First test.. 1
Second test.. 1

These two horses destroyed for glanders had been smuggled into Canada from the United States, contrary to the regulations.

Total number of horses submitted to a first test.. 247
" " " second test.. 13
" " destroyed for glanders.. 20

HOG CHOLERA.

This disease of swine has again manifested itself during the past year in certain parts of the province of Manitoba. The number of outbreaks and animals which it was found necessary to destroy is slightly in excess of the previous year. Periodical inspection and supervision has been maintained by inspectors of the department throughout many districts in the province, and owners of hogs personally advised and instructed regarding the nature and symptoms of the disease, and furnished with the departmental bulletin on Hog Cholera. This educational work appears to be productive of good results in that owners of hogs are becoming conversant with the serious nature of the disease and now report promptly all suspected cases and readily co-operate in any steps necessary to control and stamp out the disease where present, and thus prevent it from becoming established here.

Hog Cholera Statistics for Manitoba.

Number of premises visited.. 226
" swine inspected.. 4,245
" premises quarantined.. 39
" premises on which disease was found to exist.. 20
" diseased and contact animals destroyed.. 402

Total amount of compensation allowed for animals destroyed $2,965.

In the case of all premises where the disease existed, the diseased and contact infected animals were killed in the presence of an inspector, and the carcases disposed of under his supervision in a satisfactory manner, either by cremating or burying deeply. The premises were also thoroughly cleansed and disinfected under the personal guidance and supervision of an inspector, and were kept under observation and quarantine restrictions for a period of at least three months. No hogs were allowed to be again introduced or kept on the premises until the above quarantine period had elapsed.

MANGE OF HORSES.

This disease of horses has been found to exist to a slight extent during the past year. All affected and contact horses were placed under quarantine restrictions and treated at regular intervals under the supervision of an inspector, by means of the approved official mange preparation, until cured of the disease. Likewise the harness and stable utensils, together with the premises occupied, were also thoroughly cleaned and disinfected under the supervision of an inspector, before releasing the animals from quarantine.

Total number of horses inspected for mange 222
Total number of horses quarantined and treated 44

MANGE OF CATTLE

This disease has not been found affecting cattle other than among those arriving at the stockyards in Winnipeg, coming for immediate slaughter from the mange-infected area in the province of Alberta. All cattle originating west of Winnipeg have been unloaded and inspected at the Winnipeg stockyards, and animals destined to other points have been allowed to proceed only after being inspected and accompanied by the inspector's health certificate. Cattle, unless apparently healthy and free from mange, were detained and not allowed to be removed from the yards except for immediate slaughter at an establishment under inspection. During the past year a considerable number of cattle have been shipped from Winnipeg to points east and west thereof, and also to the United States. These cattle were only permitted to be shipped after having been duly inspected and accompanied by the inspector's health certificate.

The number of cattle inspected at Winnipeg was as follows:—

Cattle destined to points east of Winnipeg	4,470
Cattle destined to points west of Winnipeg	7,120
Cattle destined to points in the United States	17,003
Cattle for slaughter at Winnipeg	77,983
Total cattle inspected	106,576

Of the above cattle inspected, ninety-five were found to be affected with mange, having come from the mange-infected area in the province of Alberta.

SHEEP SCAB.

This disease has recently been found to exist among several flocks of sheep in the Lake Manitoba district. All suspected flocks have been carefully examined, and all affected and contact sheep have been placed under quarantine restrictions, and are to be treated until cured by being dipped at least twice at proper intervals of ten to fifteen days apart, under the personal supervision of an inspector, in the official lime and sulphur dip approved by the department. The premises occupied by affected sheep will likewise be properly cleaned and disinfected with limewash and carbolic acid, to the satisfaction of an inspector.

Number of sheep inspected	1,165
Number of sheep quarantined for treatment	399

In accordance with the requirement of Ministerial Order No. 40, there has been inspected at the Winnipeg yards, 31,970 sheep imported from the United States for immediate slaughter here.

GID IN SHEEP.

This disease of sheep, popularly known under the various names such as "gid," "sturdy," "turnsick" and "staggers" was observed by Inspector Still affecting a number of sheep in a shipment imported to Elkhorn, Man., from the state of Montana. The affected animals were noticed at the time of their arrival at destination, and the owner was fully advised and instructed as to the nature of the condition affecting the sheep and the proper measures to be adopted to get rid of it and to prevent its recurrence.

DOURINE.

This disease of horses has not as yet been detected in Manitoba. A stallion in the district of Gilbert Plains was reported as suspicious, but on inspection was found to be free from any affection of the generative organs, or other symptoms suggestive of dourine.

TUBERCULOSIS.

During the past year the officers of the branch here submitted to the tuberculin test, 95 cattle intended for export to the United States. Of this number, 6 reacted to the test and were therefore permanently earmarked and their export prohibited.

There was also submitted to the tuberculin test 78 cattle which are under the control and supervision of the department, 12 of which reacted and were permanently earmarked.

There has also been received from practising veterinarians located at different parts of the province, test charts recording the results of tests conducted by them on cattle with tuberculin furnished for that purpose by the department. Charts reporting the test of 489 cattle were thus received, of which 84 were reactors and were therefore officially earmarked in accordance with the regulations relating to tuberculosis.

The total number of cattle officially recorded as tested during the year in Manitoba was 662, of which number 102 reacted to the test, consisting chiefly of dairy cattle.

BLACK-LEG.

This disease is reported from time to time as causing losses among young cattle in certain districts in which it appears to be more or less indigenous. When the presence of the disease is established in any district, owners of cattle are advised as to its true nature, and to resort to protective inoculation or vaccination of the susceptible animals at proper intervals, together with their removal from known infected areas, and to properly dispose of the carcasses of any animals which have died from the disease, preferably by cremating them completely.

During the year, 318 doses of black-leg vaccine have been supplied to owners for the purpose of vaccinating their cattle.

INSPECTION OF LIVE STOCK CARS AND YARDS.

In accordance with the requirements of Ministerial Order No. 37, all stock cars destined to Winnipeg, upon being unloaded or arriving empty, unless bearing evidence of having been previously cleansed and disinfected, are cleaned and disinfected with limewash and carbolic acid before being allowed to proceed or returned to general traffic. This work is done under the personal supervision of an inspector stationed at the stockyards for that purpose, and who affixes to each car a card certifying as to the date upon which it had been dealt with. This inspection is maintained at the yards of the several railway companies here and, during the year, 6,670 cars were cleaned and disinfected.

The stockyards at Winnipeg, and at all other points throughout the province, have been inspected at certain intervals during the year by Inspector St. John, Inspector of Live Stock Cars and Yards. Each and all yards in the province have been cleaned and disinfected with limewash and carbolic acid at least once in the season, and at such other times as appeared necessary. In the case of any yards being reported or found to be in an unsatisfactory condition or poor state of repair, the attention of the railway authorities was drawn to same and they, in turn, remedied the conditions complained of. This work now having been in operation for a number of years has brought about a marked improvement in the condition of the stockyards throughout the province.

ANIMALS QUARANTINE STATIONS.

The animals quarantine stations and inspection ports in Manitoba are located at Emerson, Gretna, Bannerman, and Snowflake.

EMERSON QUARANTINE STATION.

This station is located at Emerson on the international boundary line, at a point where the Canadian Northern and Canadian Pacific lines of railway and their American connections intersect. The officer in charge at this point is Inspector Bescoby. Besides the inspector in charge, a caretaker is also maintained at this point, whose services are made use of in assisting the inspector in charge and more especially in keeping the yards and stables in good repair and cleanly condition. The yards and stables are disinfected with lime wash and carbolic acid from time to time as required.

During the year there have been presented for entry and inspection the following animals:—

Horses	5,629
Mules	468
Cattle	1,538
Sheep	13,084
Goats	19
Swine	128
Fees collected	$1,067 85

GRETNA QUARANTINE STATION.

This station is located at Gretna on the international boundary line, and is conveniently situated between the Canadian Pacific railway and the Midland branch of the Great Northern railway, each of which lines has a branch spur into the quarantine yards. The officer in charge at this point is Inspector J. A. Stevenson. Besides the Inspector in charge there is also maintained a caretaker, whose services are made use of in keeping the stables and yards in a satisfactory state. During the year there have been presented for entry and inspection the following number of animals:—

Horses	949
Mules	192
Cattle	219
Sheep	20,741
Goats	5
Swine	Nil.
Fees collected	$693 93

BANNERMAN QUARANTINE STATION.

This station is located on the B.S. & H. B. branch of the Great Northern railway at Bannerman, which is distant about 3½ miles from the international boundary line. The officer in charge at this point is Inspector F. J. Braund.

During the year there have been presented for entry and inspection the following number of animals:—

Horses	260
Mules	3
Cattle	88
Sheep	1,895
Goats	5
Swine	1
Fees collected	$125.51

SNOWFLAKE INSPECTION PORT

Snowflake which is an inspection port, is located on the Snowflake branch of the Canadian Pacific railway, distant about 3 miles from the international boundary line. The officer in charge at this point is Inspector J. C. Bonnett.

During the year there have been presented for entry and inspection the following animals:—

Horses	146
Mules	Nil.
Cattle	22
Fees collected	$36.75

There were also presented for entry and inspection at Sprague 2 horses and 3 cattle, fees amounting to $1.75 being collected on two horses.

The following summary shows the total number of animals from the United States presented for entry and inspection at the several ports of entry in Manitoba:—

Horses and mules inspected	7,649
" " submitted to a first mallein test	1,542
" " submitted to a second mallein test	25
" " which reacted and were refused entry	6
Cattle inspected	1,870
" submitted to the tuberculin test	43
Sheep inspected	35,720
Goats inspected	29
Sheep refused entry	402
Swine inspected	129
" refused entry	20
Fees collected	$1,925.79

EXAMINATION OF THOROUGHBRED STALLIONS.

During the year we have, on instructions received, made an examination for soundness and suitability of the following thoroughbred stallions, standing for service in the province:—

"John Corr", No. 521, the property of Mr. E. Payne, Wawanesa.

"Lafe", No. 488, the property of Mr. Wm. Barry, Shellmouth.

"Stage Pirate", No. 457, the property of The Canadian National Bureau of Breeding, in charge of Mr. G. Greenwood, Treherne.

"Bion", the property of the Canadian National Bureau of Breeding, in charge of Mr. D. P. Stratton, Melita.

"Vance Guard", No. 166, the property of the Canadian National Bureau of Breeding, in charge of Mr. R. C. Cochrane, Oak River.

"Brown Tony", No. 403, the property of the Canadian National Bureau of Breeding, in charge of Mr. G. Ferguson, Cartwright.

"Oraculum", No. 137, the property of the Canadian National Bureau of Breeding, in charge of Mr. Glen Campbell, Gilbert Plains.

"Kid", No. 315, the property of the Canadian National Bureau of Breeding, in charge of Mr. H. Flett, Binscarth.

"Crawford", No. 355, the property of the Canadian National Bureau of Breeding, in charge of Mr. Thos. Morris, Rosewood.

"Loricate", No. 284, the property of the Canadian National Bureau of Breeding, in charge of Baron de la Rue du Can, St. Rose-du-Lac.

"Columbus", No. 99, the property of the Canadian National Bureau of Breeding, in charge of Mr. E. P. Ash, Ashville.

MEAT INSPECTION.

The work in connection with this division has consisted in the carrying out of the various requirements of the Meat and Canned Foods Act and the regulations relating thereto.

In accordance therewith inspection is maintained at the following establishments at Winnipeg:—

The Swift Canadian Co. Ltd., designated as Establishment No. 18.
The Gordon, Ironside & Fares Co. Ltd., designated as Establishment No. 19.
The Gallagher, Holman & LaFrance Co., designated as Establishment No. 20.
The Western Packing Co. of Canada Ltd., designated as Establishment No. 21.

During the year a competent staff of thirteen veterinary inspectors and three lay inspectors has been assigned and stationed on duty at these establishments.

Besides the actual work of technical inspection which is made of animals before and at time of slaughter, a close supervision is also exercised by the inspectors over the further preparation of all meat and meat-food products. Due regard is also given to the sanitary conditions existing at these establishments, and no carelessness in this respect is permitted.

During the first week in June, 1913, there was held at Winnipeg a Public Health Exhibition, at which this branch was asked to make an exhibit. On receiving your authorization, an exhibit was made, consisting of fresh and prepared specimens, showing, among other conditions, tuberculosis in different stages of development and affecting the organs and carcases of both cattle and swine, actinomycosis, measles affecting beef and pork, hog cholera, etc. These were supplemented by illustrations and photographs. Two inspectors were placed in charge of the exhibit, and explained to the many interested visitors the specimens on view and also the nature of the work conducted by the department through the Meat Inspection Service. Suitable literature in the nature of pamphlets and bulletins were also distributed. The exhibit attracted considerable attention and received much favorable comment and was no doubt of great educational value to the public in showing the precautions taken by the department to prevent the possible transmission of disease to human beings through unwholesome and diseased meat and meat-food products, thus safeguarding the public health from this source as far as possible.

All of which is respectfully submitted.

I have the honour to be, sir,

Your obedient Servant,

C. D. McGILVRAY, Inspector.

APPENDIX No. 5.

D. S. Tamblyn, D.V.S., Inspector in charge Saskatchewan.

REGINA, March 31, 1914.

SIR,—I have the honour to submit herewith my annual report for the fiscal year ending March 31, 1914, for the province of Saskatchewan.

The work performed by the officers of the Health of Animal Branch of the Department of Agriculture, is as follows:—

GLANDERS.

In connection with this disease I feel that you, as well as those interested in the eradication of glanders, will appreciate the marked decrease in the number of outbreaks, as also the number of animals destroyed affected with this malady in this province during the past fiscal year. The policy followed has been identically the same as that of previous years, namely, the destroying of all reactors and the testing of all direct contacts, which I may state is proving a very effective manner of eradication.

It is also very noticeable that the farmers in general feel their duty more keenly in reporting suspicious cases of this disease. In short, the present situation is most encouraging, and I think the future can be looked forward to with great confidence.

The total number of animals submitted to mallein throughout the province is as follows:—

Horses	5,003
Mules	170
Asses	1
Burros	1

Out of the above the following animals were tested at the different boundary points:—

	Horses.	Mules.	Asses.	Burros.
North Portal	1,300	98	1	1
Big Muddy	211	7		
Marienthal	129	2		
Willow Creek	137	4		
Wood Mountain	626	22		
Northgate	15			

Two hundred and thirty-five (235) of the total number of animals tested, reacted, and were dealt with as follows:—

North Portal, 36 rejected and returned to U. S. A.
Big Muddy, 4 rejected and returned to U. S. A.
Wood Mountain, 3 rejected and returned to U. S. A.
Northgate, 1 rejected and returned to U. S. A.
Marienthal, 2 rejected and returned to U. S. A.

One hundred and eighty-six (186) native horses and three (3) mules were destroyed. One hundred and sixty-five (165) horses first test, twenty (20) second test, one (1) third test; two (2) mules first test, and one (1) second test. Seventy-one (71) of the total number of animals destroyed exhibited clinical symptoms.

Total value of horses and mules destroyed $29,255.

Total compensation of horses and mules destroyed, $19,070.

Four imported horses valued at $500 were destroyed without compensation.

Compensation on one Canadian horse destroyed, valued at $150, was forfeited for violation by owner of the regulations of the department.

HOG CHOLERA.

In connection with hog cholera I would say that there was a considerable increase in the number of outbreaks this year over those of last.

The infected districts were as follows: Estevan, Souris, Moosejaw, Gravelbourg, Morse, Broderick, Thunder Creek, Crane Lake, Hawarden, Kerrobert, LacVert, Saskatoon, Luseland, and South Qu'Appelle.

Total number of swine under control	7,044
Total number of diseased and contact swine destroyed	3,825
Valuation	$32,622 13
Compensation	21,348 08

Compensation was withheld on 322 hogs destroyed, valued at $3,516.60.

This action was deemed advisable owing to the owners of the animals deliberately violating section 8 of the regulations of this department relative to hog cholera.

The history of a number of outbreaks dealt with by our officers during the past year tends to prove conclusively that the infection was caused by the feeding of garbage collected from hotels. This, I may state, was very noticeable in infected areas in close proximity to towns.

In the vicinity of Saskatoon, for instance, a number of swine owners were warned against the feeding of hogs on uncooked garbage or kitchen refuse, or on any raw animal flesh or similar food likely to convey the infection of hog cholera or swine plague, and were handed a copy of the regulations as well as the bulletin issued by this department in connection with this malady. Their rejecting of our officer's advice along these lines resulted in a second outbreak on their premises, with the result that they forfeited their rights to compensation.

I am also under the impression that the spreading of this disease was greatly due to neighbours visiting infected premises, where they had gone to sympathize with the owners, not thinking of the danger they were running into of carrying the infecton to their own animals.

All means of disseminating the disease have been explained to owners of swine.

My notice has also been drawn to the fact that often a number of hogs are shipped to abattoirs for immediate slaughter. Many of these animals upon arrival are found to be in an unfit condition for slaughter; therefore, they are culled out and sold to any one. In most instances, farmers purchase such animals and remove them to their farms. The point I wish to draw your attention to here is that the hogs so purchased are sometimes obtained from infected areas, so that there is a tendency to spread the infection through this channel.

Another channel of infection which I consider of great danger is through the importation of live stock other than swine; owners of stock often bring along in their cars hog troughs, which in many cases may have originated from infected areas.

Wheat, barley, hay, and litter accompanying such importations are also a source of danger. The origin of the Kerrobert and Luseland outbreaks I attribute to this source, as most of the settlers in that part of the province immigrated from the states of Minnesota and Iowa.

While we were unable in this province to show any marked success during the early part of the year, as was anticipated, yet at the present time the control of this

disease appears assured. Training the farmers to report the existence of the malady on his premises has been one of our great setbacks. Many of the farmers originally resided in the United States, and were not acquainted with our regulations, being under the impression, therefore, that no action was taken by the Dominion Government, and were content to permit their animals to die, saving those only that might escape infection, or which recovered after a slight attack.

I personally dealt with a number of outbreaks of hog cholera and have investigated the general condition from time to time.

During the past year the work of this department's officers in connection with hog cholera has not been entirely confined to outbreaks. Their services have had an educational value, in explaining to the farmers the different sources of infection and preventive measures, and free distributon of the bulletin issued by the Department.

HORSE MANGE.

Horse mange showed a slight increase. However, the disease is well under control due to the prompt steps taken to eradicate same by our officers. The following will show the amount of work performed in connection with this disease:—

Nine hundred and forty-one (941) horses and one (1) mule on inspection proved healthy.

Two hundred and twenty-five (225) horses and two (2) mules were placed under quarantine, out of which one hundred and seventy-seven (177) animals were found affected.

Eighteen (18) horses quarantined from the previous year were redressed and released.

Apart from the foregoing, numerous reinspections were made by our officers for the purpose of supervising the redressing of diseased and contact animals, and to see that all contact matter had been properly cleansed and disinfected in accordance with the regulations of this department.

TUBERCULOSIS.

In connection with this malady I have, for convenience, classed the cattle tested as follows:—

Imports.—Fifty-two (52) cattle were submitted to first test. No reactors.

Exports.—One hundred and twenty-nine (129) cattle were submitted to first test, five of which reacted, while one gave a suspicious reaction. One hundred and twenty-three (123) were tested, with negative results.

Official.—Two hundred and fifty-three (253) were submitted to first test, seventy-four (74) of which reacted, thirty-seven (37) gave suspicious reactions, one hundred and forty-two (142) were tested with negative results; thirty-one (31) of the above cattle were retested, ten (10) of which reacted and six (6) gave suspicious reactions, while fifteen (15) gave no reaction.

General.—Under this heading is shown the cattle tested by private practitioners with tuberculin supplied from this office at the request of owners. One hundred and sixty-seven (167) submitted to first test, twenty-six (26) reacted, one (1) suspicious, one hundred and forty (140) gave no reaction.

I personally tested ninety-seven (97) head of Hereford cattle for export. While under the head of official testing, I submitted to first test one hundred and ninety-four (194) head of cattle, seventy-four (74) of which reacted. I also retested thirty-one (31), ten of which reacted. The last mentioned, I may state, were confined to those herds which were placed under the control of this department by the respective owners, for the purpose of eradicating this insidious disease from their herds.

SHEEP SCAB.

This disease did not make its appearance in this province during the past year.

RABIES.

A suspected case of this disease was reported by Dr. Sharpe, of Rocanville, but upon the specimen taken from the suspected dog being forwarded to the pathologist, it was found impossible to confirm the suspicion.

BLACK QUARTER.

This malady I regret to state is causing a great deal of anxiety to the farmers in certain districts of this province, due to the marked increase in the number of outbreaks during the last year. The numerous requests at this office for black-leg vaccine and information relative to this disease have increased to an alarming extent.

I may state that all the information possible has been sent out together with a free distribution of this department's bulletin dealing with same. The dissemination of the disease is no doubt due to the farmers not taking the necessary precaution in disposing of carcasses of animals which succumb to the disease, and in not vaccinating their young stock.

However, I am pleased to state that the farmers in most parts of the province have now been instructed relative to the preventive measures to be taken in eradicating this malady. It is therefore anticipated that this disease will show a marked decrease during the coming year.

Total number of doses of black-leg vaccine sold during the past year	7,407
Instruments	127
Needles	68
Value	$442.35

INSPECTION OF STOCK YARDS AND STOCK CARS.

This branch of the work has been increased to a great extent, especially in view of the fact that hog cholera showed a tendency to advance. Under the circumstances, it necessitated, therefore, a careful vigilance over all stock cars, especially those originating from affected areas and which were used in connection with the transportation of swine. I am pleased to state, however, that the officials of all railways in this province appear to recognize the danger of disseminating this malady through this channel. When approached they are only too anxious to assist our officers in their duty, both in the disinfection of stock cars as well as stock yards, which is of so much importance.

Total number of stock cars cleansed and disinfected at Moosejaw during the fiscal year ending March 31, 1914, 1,892.

The stock yards over all lines of railways in this province are in an excellent condition.

NORTH PORTAL QUARANTINE STATION.

The following figures show the number of animals presented for entry and inspection at the port of North Portal during the past fiscal year:—

Horses	8,599
Mules	554
Cattle	4,930
Sheep	196
Goats	9
Swine	18
Asses	11
Fees	$1,657.62

Horses tested	1,299
" retested	196
" reactors—	
First test	30
Second test	6
" B. A. I.	7001
Mules tested	98
" retested	2
" B. A. I.	452

Asses tested, 1 and 1 burro.
" B. A. I., 1.
1 Shetland pony.
2 horses and 1 foal temporarily rejected for mange.
Cattle tested, 49.

MARIENTHAL INSPECTION PORT.

The following figures show the number of animals presented for entry and inspection at the port of Marienthal during the past fiscal year:—

Horses	276
Mules	7
Cattle	47
Fees	$100.75

Horses tested—	
First test	129
Second test	24
Mules tested	2
Horses (B.A.I.)	104
" Reactors	2
Cattle tested	0

WOOD MOUNTAIN QUARANTINE STATION.

The following figures show the number of animals presented for entry and inspection at the port of Wood Mountain during the past fiscal year:—

Horses	1,420
Mules	28
Cattle	51
Sheep	8,803
Fees	$784.45

Horses tested—	
First test	626
Second test	10
Reactors	3
B. A. I.	439
Cattle—	
Tested	3
B. A. I.	1
Mules tested	22

NORTHGATE QUARANTINE STATION

The following figures show the number of animals presented for entry and inspection at the port of Northgate during the past fiscal year:—

Horses	94
Mules	4
Cattle	15
Fees	$2.50
Horses tested—	
First test	15
Reactors	1
B. A. I.	79
Mules tested	2
" B. A. I.	2

WILLOW CREEK QUARANTINE STATION.

The following figures show the number of animals presented for entry at the port of Willow Creek during the past fiscal year:—

Horses	211
Mules	4
Cattle	nil.
Sheep	3,462
Fees	$135.44
Horses tested (first test)	137
" B.A.I.	66
Mules tested	4

BIG MUDDY QUARANTINE STATION.

The following figures show the number of animals presented for entry and inspection at the port of Big Muddy during the past fiscal year:—

Horses	1,063
Mules	27
Cattle	40
Sheep	Nil.
Fees	$116.75
Horses tested—	
First test	211
Second test	13
Reactors	4
B.A.I.	186
Mules tested—	
First test	7
B.A.I.	6

The following is a summary showing the total number of animals presented for entry and inspection at the various quarantine and inspection ports in the province of Saskatchewan:—

Horses inspected	11,665
Mules "	624
Cattle	5,083
Sheep	12,461
Swine	18
Asses	11
Goats	9
Total amount of fees collected	$3,127.51

FIELD OFFICERS' MOVEMENTS.

The following officers resigned: Inspectors C. Head and McIntosh, while H. Decock, of Wood Mountain, was appointed range rider, succeeding R. Decock. Inspector McLeish was transferred from this department to the Meat Inspection Service at Calgary. Inspector C. Brind was transferred from the field service in Saskatchewan to the Meat Inspection Division at Winnipeg. Inspectors MacConachie and Shonyo were employed in this province for a short period during the past fiscal year in connection with hog cholera work. Their services being no longer required they returned to their permanent headquarters, Vancouver and Winnipeg, respectively.

Miss W. Creswell, the stenographer at the Regina office resigned and was succeeded by Miss L. Cook.

BOUNDARY INSPECTION WORK.

In connection with boundary work in this province, I beg to state that there was very little change in the personnel of the different ports.

Inspector A. Hobbs was transferred from the Meat Inspection Division at Edmonton to the Health of Animals Branch, and was placed in charge of the Northgate quarantine station, while H. L. Cass, V.S., was temporarily engaged and given charge of the quarantine station at the port of Big Muddy, this officer holding the dual position of veterinary officer and sub-collector of customs, vice Inspector H. S. Manhard, resigned.

The port of Northgate on the line of the Grand Trunk Pacific was officially declared a Quarantine Station on March 15 last. This port will no doubt be of importance during the coming year, as I understand that the Grand Trunk Railway Company was not in a position to handle stock over their line during the past spring season, owing to certain difficulties with other companies relative to divisional point and rates.

There have been special stables and a corral built at the above port, so that the facilities are ample to cope with any shipment that may be presented.

The inspection port of Marienthal was officially declared closed on November 1, 1914. The officer in charge, Inspector E. A. Meakings, being transferred to field work of this branch of the service, with headquarters at Saskatoon.

During the year I visited the ports of Northgate, North Portal, and Big Muddy, with a view of inspecting same and discussing matters in general with the officers relative to stock importation, and other important points

STALLION INSPECTION.

Under the above heading, I may state that the officers of this department in this province examined twenty stallions for soundness during the past fiscal year.

DOURINE.

In connection with the above malady, I may state that the officers in this province have been called upon to quarantine a number of suspected and contact cases, and have worked in conjunction with Dr. J. C. Hargrave and his officers, with a view of eradicating same. Samples of blood were procured from the animals placed under quarantine and forwarded to the pathologist in charge at Lethbridge, Dr. A. Watson, for the serological test.

I have the honour to be, sir,

Your obedient servant,

D. S. TAMBLYN,
Inspector.

APPENDIX No. 6.

(J. C. Hargrave, D.V.S., Inspector in charge, Alberta.)

MEDICINE HAT, March 31, 1914.

SIR,—I have the honour to submit herewith my report for the year ending March 31, 1914, in connection with the Health of Animals Branch for the province of Alberta and such portions of British Columbia and Saskatchewan within which a part of the work being under the supervision of this office, such being the carrying out of requirements of the Animal Contagious Diseases Act and the regulations made thereunder, in addition to which various investigations of other diseases not mentioned in the Act.

Needless to say, at no time has the service of your inspectors been other than fully occupied in this work, the diseases demanding the greater amount of their time being dourine, hog cholera, and mange.

DOURINE.

I regret to have to advise you that a very extensive outbreak of this disease was detected in the southwestern portion of Alberta, which has necessitated the placing under quarantine restrictions of several large herds of horses, the securing of blood for laboratory testing from a very large number and the tracing of contacts disposed of from these various ranches and shipped to points not only in Alberta but Saskatchewan. This has entailed a great deal of work, but is progressing as rapidly as can be expected. The excellent work performed at the laboratory under the direction of Dr. Watson has permitted of this work progressing more rapidly than has been possible in the past, and permits of the different herds being released in a much shorter time than heretofore.

Attention was directed in my last annual report to the possibility of the disease being eradicated at an early date in the two provinces, Alberta and Saskatchewan. The outbreak above referred to as extending in a portion of the province of Alberta has evidently been a recurrence of the one dealt with in the vicinity of Magrath some three years ago, and, owing to the extensive leases in the neighbourhood whereon horses are very rarely, if ever, held under close observation, the disease evidently spread to a considerable extent before being detected, with the result that the number of infected animals found, in comparison with the figures for the past three years, is very large. Immediately however, that the existence of this outbreak was first brought to the attention of your inspectors, arrangements were made to proceed with the work of collecting laboratory material, and, although the climatic conditions were not very favourable, as the work had to be done during the winter months, yet over two thousand (2,000) head being tested, which would not have been possible had not every assistance been rendered by the owners and officials of the various ranches dealt with.

Statistics for Alberta.

Number of animals quarantined	4,397
" " slaughtered (including 28 registered animals)	459
Value	$71,015.00
Compensation	$47,343.21

Statistics for Saskatchewan.

Number of animals quarantined	79
" " slaughtered	12
Value	$2,100.00
Compensation	$1,399.98

GLANDERS.

Practically the same number of tests was made this year as was made a year ago with, however, a lesser number of reactors. Ninety-nine (99) head of horses were slaughtered for this disease, as compared with 151 a year ago. You will also remember that one of the inspectors of the department spent some two months in the more newly settled portion of the northern part of the province, namely, in the Peace River and Grand Prairie districts. During his entire trip no evidence of this disease was detected, although a number of tests was made at different points.

The major portion of those slaughtered was found in three outbreaks occurring in the Taber and High River districts, and in one outfit of construction horses.

In the Taber and High River districts this disease was dealt with in previous years, and the source of infection determined upon in the cases dealt with this year would indicate that all the contacts in the first instance had not been located. I think, however, that the work performed in these two districts this year will have the desired effect, as attention was directed to every possible contact; although there is always the danger that an occasional isolated outbreak from these old infected districts will occur from time to time.

Statistics for Alberta.

Native horses—	
Number of horses tested once	2,554
" " " twice	457
" " " thrice	30
" " slaughtered on inspection	4
" " " " first test	80
" " " " second test	13
" " " " third test	2
Value	$13,420.00
Compensation	$ 8,946.66
Number of horses presenting clinical symptoms	37
Import horses—	
Number of horses tested once	129
" " twice	1

In addition to the above, two (2) Indian horses imported from Montana were tested in Saskatchewan.

MANGE.

Aside from the further treating of horses remaining in quarantine at the commencement of the year, there were 11 premises and 928 horses quarantined, of which number 106 presented evidence of the disease.

I also beg to report that this disease among cattle was again found to exist to a lesser extent than a year ago, and the disease is now confined to a few isolated areas within the territory covered by the Special Mange Order which, however, owing to their

situation, permitted us to curtail the boundaries of the area to some extent only, that is to say, the northern boundary in the province of Alberta was removed from the line between townships 42 and 43 to the line between townships 34 and 35. It is just possible that the eastern boundary of the area may be moved westward at the close of the present season.

Statistics for Alberta

Cattle mange—

Number of premises quarantined	129
" cattle quarantined	53,303
" cattle dipped once	66,003
" " dipped twice	64,598
" " hand treated	905

STATISTICS FOR SASKATCHEWAN.

Number of premises quarantined	23
" cattle quarantined	8,178
" " dipped once	15,480
" " dipped twice	15,090

TUBERCULOSIS.

There have been submitted to the tuberculin test by your inspectors, 395 head of cattle. All but two proved healthy. There were also tested by qualified practitioners, 329 head of cattle, with tuberculin supplied by your department. Of this number 7 reacted and were ear-marked in accordance with the regulations. In addition to the above, 48 import cattle were tested on reaching destination (Christie).

BLACKQUARTER.

This disease has apparently been on the increase as it has been reported from practically every portion of the province, and the number of applications for vaccine, and other inquiries, received at this office, as also by inspectors in different portions of the province, is sufficient evidence of this fact. At all times the inspectors endeavour to distribute information from a preventive point of view, and where vaccine has been requisitioned, bulletins in connection with the disease have always accompanied orders.

Total number of doses sold during the past year, 17,875.

RABIES.

It is very gratifying to be able to inform you that there has been no recurrence of this disease in the province.

HOG CHOLERA AND SWINE PLAGUE.

This disease of hogs has manifested itself to a greater extent than ever before in this province, and the investigation by inspectors indicates that the feeding of uncooked refuse and garbage from hotels and restaurants is responsible for these numerous outbreaks. Hog raisers, however, are commencing to realize the necessity of thoroughly cooking this garbage, and many have discontinued using it. Two cities within the province have taken steps to prevent its use by collecting all such refuse and disposing of it through their incinerators.

The number of premises on which disease was found	104
" diseased and in contact hogs destroyed	2,393
Value	$20,993.75
Compensation	$13,995.84

In addition to the above, 1,611 hogs were slaughtered and found fit for consumption, while compensation was withheld in the case of 187 diseased hogs (included in 2,393).

The above figures do not include 35 hogs killed in British Columbia. Owners, Crows Nest Pass Lumber Co. Compensation, $525.

BOUNDARY STATIONS.

Pinhorn.

Entries at this port:—

Horses	(1 foal)	48
Mules		5
Cattle	(5 calves)	12
Sheep	(2,815 lambs)	7,699
Fees collected		$350.14

Coutts.

During the year an inspector's residence was built at this port, which has improved living conditions at that point very materially, in addition to which a well was sunk in connection with the quarantine accommodation at that point.

Entries at this port:—

Horses	(35 foals)	677
Mules		27
Cattle	(18 calves)	5,265
Sheep	(1,493 lambs)	79,273
Swine		6
Fees		$2,372.75
Number of reactors rejected		4
" contacts "		8

Twin Lakes.

Entries at this port:—

Horses	(13 foals)	235
Mules		4
Cattle	(1 calf)	25
Fees		$83
Number of reactors		nil.

Gateway.

Entries at this port:—

Horses	(5 foals)	235
Mules		21
Cattle	(4 calves)	7
Swine		10
Fees		$99.77
Number of reactors		nil.

Kingsgate.

Entries at this port:—

Horses	(77 foals)	1,667
Mules		69
Cattle		172
Sheep		4,729
Fees		$297.18
Number of reactors rejected		1
" contacts "		1

I have the honour to be, sir,

Your obedient servant,

J. C. HARGRAVE,
Chief Inspector for Alberta.

APPENDIX No. 7.

(S. F. Tolmie, V.S., Chief Inspector in charge British Columbia.)

Victoria, B.C., March 31, 1914.

Sir,—I have the honour to submit my annual report for the year ending March 31 1914.

I am pleased to say that as far as contagious diseases of animals are concerned, the situation in British Columbia has much improved during the year. This is particularly noticeable in the case of hog cholera, a disease that occurs more frequently than any other here. Last year there were 110 outbreaks, and $11,405.19 was paid in compensation. This year only 86 outbreaks occurred, and but $5,320.88 in compensation was paid. This has been largely due to the dissemination of information among hog owners through the Hog Cholera Bulletin issued by the department, and also to the careful house-to-house inspection carried on whenever inspectors have been available for the work.

Mange has not shown itself at all this year, and but few cases of glanders were encountered. This is in strong contrast to what was experienced in British Columbia in connection with this disease some years ago.

Rabies.—An outbreak of rabies was reported at Mission, but no confirmatory evidence was secured. During March, 1914, this disease was reported at Duncans, on Vancouver Island, and vigorous steps are being taken for its eradication.

Stock Car Inspection has greatly increased, and this part of the service is becoming more efficient from year to year.

Excellent work has been performed by your Inspectors on the boundary line. Prompt service has been rendered, and a number of diseased animals rejected.

Stock Yard Inspection has been well carried out and, on the whole, the yards in this province are in a very creditable condition.

A number of cattle have been tested by your inspectors for the Dominion Live Stock Branch in connection with their policy for the distribution of pure-bred sires.

Blackleg has appeared occasionally during the year. The farmers are now vaccinating freely. A large number of doses of blackleg vaccine and outfits have been distributed. In this connection the farmers of the Nicola valley and the Health of Animals branch are indebted to Mr. J. A. Guichon, of Quilchena, who kindly stocks and distributes this material without charge.

One case of Dourine was condemned and destroyed by Inspector Jermyn at Osoyoos, the mare in question being presented for entry in this province.

One report of Anthrax was received but on investigation it proved to be groundless.

Inspector Maconachie was ordered to Saskatchewan during the winter, and was engaged there from January 10 to February 18.

The following is a brief summary of work performed within the province and at boundary ports:

Glanders—	
Native horses tested once	48
Native horses tested twice	3
Horses slaughtered	2
Horses showing clinical symptoms	2
Value	$215.00
Compensation paid	$143.33

Hog Cholera—	
Premises quarantined during year	98
Premises in quarantine at end of year	20
Hogs died	241
Hogs slaughtered under inspection and passed	576
Diseased hogs slaughtered	814
Value of diseased hogs slaughtered	$7,956.50
Value of hogs slaughtered for post mortem purposes	24.98
Compensation paid	5,320.88

Compensation was withheld from two owners on account of non-compliance with the regulations.

Mange—	
Number of premises quarantined during year	23
Remaining in quarantine at end of year	9

The above premises are those used in connection with the slaughter of cattle from the Mange areas of Alberta and Saskatchewan.

Rabies—	
Quarantines imposed	18
Premises still under quarantine	14
Stock cars inspected	3,769
Cattle inspected for export	27
Boundary inspection—	
Number of horses inspected	3,024
Colts	76
Mules	80
Cattle	762
Calves	68
Sheep	66,204
Swine	73
Goats	741
Asses	8
Peccaries	8
Elk	7
Horses tested once	1,180
Mules	31
Asses	4
Horses tested twice	9
Horses reacting to test	21
Mules	12
Contacts rejected	62
Horses presented second time	9
Cattle tested	137
Rejected	1
Total amount of fees collected	$3,341.04

Please find attached details of boundary inspection at each port in this province.

Valuable services have been rendered by Dr. Hadwen, the pathologist in charge of the research laboratory at Agassiz, in connection with the diagnosis of obscure diseases.

I have the honour to be, sir,

Your obedient servant,

S. F. TOLMIE,
Chief Inspector for British Columbia.

DETAILS OF BOUNDARY INSPECTION.

Name of Port.	Horses.	Mules.	Cattle.	Sheep.	Swine.	Goats.	Asses.	Peccaries.	Elk.	Reactors.			Retested		In contacts Tested.				Native horses tested.	Tourine.	Export.	Cars cleaned.	Fees.
										H.	M.	C.	H.	M.	H.	M.	C.	A.					$ cts.
Osoyoos	416	12	48	185	0	0	0	0	0	18	12	0	46	1	412	12	3	0	....	1	....	....	75 80
White Rock	932	11	56	25,792	3	8	6	0	5	0	0	1	0	0	37	0	16	2	....	....	11	143	906 00
Huntingdon	693	29	139	7,018	8	665	2	0	0	1	0	0	1	0	143	4	28	2	....	....	....	....	593 23
Vancouver	204	12	20	28,224	0	58	0	8	2	0	0	0	0	0	29	0	0	0	....	....	....	3,244	804 32
New Westminster	....	....	9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4 20
Nelson	26	2	21	....	....	....	....	....	....	....	....	....	....	....	13	2	15	....	....	....	....	111	32 00
Rossland	65	0	56	476	....	....	....	....	....	....	....	....	....	....	41	0	13	0	....	....	....	....	151 45
Ryckerts	25	0	0	0	....	....	....	....	....	....	....	....	....	....	25	0	0	0	....	....	....	....	1 00
Grand Forks	167	7	315	400	61	2	....	....	....	1	....	....	....	....	163	7	49	....	....	....	1	....	347 27
Midway	102	0	28	3,102	....	....	....	....	....	....	....	....	....	....	74	0	8	....	....	....	....	....	136 77
Keremeos	103	2	3	162	1	....	....	....	....	....	....	....	....	....	63	2	0	0	....	....	....	....	39 60
Bridesville	126	4	38	....	....	....	....	....	....	1	....	....	1	....	126	4	....	....	....	....	1	....	101 45
Myncaster	40	0	1	....	....	....	....	....	....	....	....	....	....	....	38	0	1	0	....	....	....	....	17 25
Victoria	125	1	28	845	0	8	....	....	....	....	....	....	13	....	16	....	....	....	....	....	....	....	126 70
Kamloops	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	19	
Totals	3,024	80	762	66,204	73	741	8	8	7	21	12	1	61	1	1,180	31	137	4	....	1	13	3,517	3,341 04

SESSIONAL PAPER No. 15b

APPENDIX No. 8.

(W. W. Stork, V.S., Inspector in charge, Toronto).

TORONTO, March 31, 1914.

SIR,—I have the honour to forward annual report for the year ending March 31, 1914.

During the year my time has been occupied by departmental business at Toronto office of Health of Animals Branch of the Department of Agriculture, and in making investigations, from time to time, of reported outbreaks of contagious disease in various points.

During the year just passed the location of Toronto office has been changed, having been removed from Temperance street to West Toronto, in close proximity of Union stock yards, where a large proportion of the live stock trade has become centralized.

The change has proven beneficial in a large degree as, the officers being practically on the ground, no delay occurs in the inspection of stock and issuance of certificates for large export trade that developed in the past few months.

During the month of October, certificates covering the inspection of 37,790 cattle and 1,809 calves, about to be exported to the United States, were issued at Toronto office.

The Toronto office having now been established some five years, the work has assumed large proportions and, with the efficient staff directed from this office, the various stock yards, railway disinfection plants, and horse sale stables, are properly looked after.

As regards cleanliness and sanitary equipment, special attention is always given to the disinfection of stock cars, which fact can be attested to by cleanly appearance of empty stock cars now noticeable during transit.

Within the past year officers from Toronto office have been employed in twice supervising, at an interval of ten days, a very large number of pure-bred sheep intended for export to the United States.

They have also tested with tuberculin a number of pure-bred cattle, about to be consigned to the province of British Columbia, in addition to the animals exported to the United States.

Thoroughbred stallions entered for Government bonus have been examined for soundness by officers of this branch at numerous points in Ontario, the results of examination being promptly forwarded to your department.

Owing to resignation of resident inspector at port of Cobourg the business at this port was conducted from Toronto office; however, a new appointment of inspector for this port has now been made.

Regarding contagious diseases of stock in and around Toronto, I am pleased to state that, while many investigations of reported suspected trouble have been made, nothing of a very serious nature, excepting hog cholera, has occurred, the trouble being energetically dealt with.

RABIES.

From time to time isolated cases have come to our notice in districts which were formerly the seat of this trouble. In each case either destruction of contact dogs or enforced quarantine was rigidly enforced, and I am pleased to state the percentage of cases has been greatly reduced.

HOG CHOLERA.

During the year, several serious cases of hog cholera developed in vicinity of Toronto, the trouble, we believe, emanating from hogs being fed on table refuse.

Every outbreak was energetically dealt with, special attention being given to rigid quarantine enforcement and disinfection of premises.

By visits and keeping in touch with owners of large piggeries at outskirts of Toronto, we are cognizant of existing conditions, and no time is lost in making investigation of any reported suspected trouble.

We have impressed on owners the necessity of keeping premises in sanitary condition, and are doing our best to discourage the use of refuse food.

SHEEP SCAB.

I am exceedingly pleased to state that in this district at least the trouble is apparently eradicated, and that not one authentic case has been dealt with during the past year.

ANTHRAX.

During the year several reports of this disease were investigated and, with the exception of one case, vicinity of Collingwood, Ont., all suspected cases terminated in the trouble being other than true anthrax.

GLANDERS.

In and around Toronto no case of glanders has been dealt with during the past year, the nearest cases being in the districts of Simcoe and Frontenac, where horses were destroyed as being infected with the disease.

I have endeavoured to be prompt with returns to department of all business transacted at Toronto office, and attached hereto is compiled statement of export and import animals, which I trust will be found accurate and correspond with statements rendered from time to time during the fiscal year.

I have the honour to be, sir,

Your obedient servant,

W. W. STORK.

APPENDIX No. 9.

(W. H Pethick, V.S., Inspector in charge, P.E.I.)

CHARLOTTETOWN, March 31, 1914.

SIR,—I have the honour to present herewith a brief report for the year ending March 31, 1914.

During the whole of this period my work has been largely in connection with the Meat Inspection Service in Prince Edward Island. As you have been kept fully informed by daily reports of every phase of the work here, I presume that further comment is unnecessary.

As your representative in the Health of Animals Branch, I am glad to be able to state that all classes of farm animals have been remarkably healthy during the past year. My services have, however, been utilized as heretofore in connection with reported outbreaks of contagious disease. Such matters were promptly and carefully investigated, and already fully reported upon.

The enforcement of the regulations concerning the inspection of foxes has added much to my work. All importations were carefully examined at the port of entry, and each animal re-examined at the expiration of twenty-one days from the date of landing. A few foxes affected with mange were promptly dealt with. Duplicates of all papers issued by me or in any way relating to the work referred to, have been forwarded to you from time to time.

PORT INSPECTION.

You will observe from my reports sent you monthly that the following animals were exported to Newfoundland from Summerside:—

Horses	1
Cattle	216
Sheep	383
Swine	1

These animals were carefully examined and found free from disease.

In compliance with your instructions, I have, as in the past, endeavoured to be of service to our stock owners by advising them, both in public meetings and elsewhere, as to the best means of keeping their flocks and herds healthy, my remarks being confined as much as possible to subjects having a close relation to the work of the Health of Animals Branch, including the Meat Inspection Service and its requirements.

During the year I have visited many sections of this province, and have thus been able to keep fully informed on all matters connected with both divisions of your branch of the service.

In conclusion, I wish to record my appreciation of the ready willingness with which the officers associated with me in the work have discharged their duties.

I have the honour to be, sir,

Your obedient servant,

W. H. PETHICK,
Inspector.

APPENDIX No. 10.

(M. V. Gallivan, V. S., Inspector, Lethbridge)

LETHBRIDGE, ALBERTA,

March 31, 1914.

SIR,—I have the honour to forward this my annual report for the year ending March 31, 1914.

INSPECTION OF STOCK.

The number of animals inspected for shipment during the past twelve months are as follows:—

Horses	136
Cattle	186
Mules	33

Of the above sixty-one (61) horses, four (4) mules, and one hundred and forty-six (146) cattle were consigned to points outside the province of Alberta.

During month of May, I went to Nogales, Old Mexico, to inspect a number of cattle purchased by Messrs. Furman & Hill, which they intended to ship to Alberta.

These cattle were thoroughly inspected and dipped before a permit allowing owners to ship them to Canada was granted.

I have had the opportunity of inspecting these cattle several times since their arrival in this province, and on each occasion found a remarkable improvement in their condition.

GLANDERS.

I have tested five (5) native horses for glanders, all of which proved to be free from the disease. I have also examined a number of horses which were suspected to be affected, and found the symptoms which gave rise to suspicion to be due to caries teeth and other diseases of a non-contagious character.

CATTLE MANGE.

This disease still exists in district under my supervision, especially in the southern portion where the large ranches are located. The Knight Sugar company dipped their herd once last fall, but were unable to complete the second treatment owing to difficulties encountered with apparatus for heating vat, and repairs could not be completed in time to do dipping before the cold weather set in.

I have interviewed company's manager, who has promised to have necessary repairs made in the near future, and to thoroughly treat twice all cattle on company's premises.

Number of cattle dipped twice	4,000
" " once	6,017

MANGE IN HORSES.

Forty head of horses were found to be affected with mange on Knight Sugar Company's premises, which were promptly quarantined and successfully treated, and a recommendation for release of premises forwarded.

The disease re-appeared this winter in a band of one hundred (100) head which ranged together in a south pasture field. The diseased horses, thirty (30) in number, and all contacts, were immediately quarantined and dipped in a cage vat containing lime and sulphur solution, to which had been added a quantity of paraffin oil.

This treatment was somewhat harsh, especially in cold weather, and was the means of killing several of animals dipped, but it seems to have had the desired effect, as the disease has disappeared from balance of bunch affected.

It was not my suggestion to add oil to lime and sulphur solution, but, on the contrary, I attempted to dissuade owners from using it at all.

HOG CHOLERA.

I have dealt with two outbreaks of this disease, one of which occurred on premises of Crowsnest Pass Lumber Company at Galloway, B.C., and the other on premises of J. B. Jett & Co., of Taber, Alberta. The origin of both these outbreaks was due to feeding uncooked garbage, and I found it necessary to slaughter one hundred and forty-six (146) hogs, all of them being sufficiently affected with disease to render carcasses unfit for human food. I have also investigated several reported outbreaks which occurred on three different farms and found losses which occurred to be due to errors in feeding or diseases which are non-contagious. When dealing with the three suspected outbreaks I found it necessary to slaughter 4 swine for post-mortem purposes.

Total number of hogs quarantined on 5 premises	282
Total number of hogs slaughtered	150
Total valuation of hogs slaughtered	$2,250
Total compensation paid	$1,500

TUBERCULIN TEST.

I have tested one animal for tuberculosis, and found animal to be free from the disease.

DOURINE.

An outbreak of this malady occurred amongst the large herds of horses owned by Knight Sugar Company and Mr. Ray Knight, who control extensive ranches in the Raymond district. The source from which these outbreaks originated cannot be positively stated, but suspicion strongly points to a syndicate percheron stallion, known as the Allen horse, which was imported from Oregon. This stallion was found to be diseased shortly after termination of first season's service in Canada, and died of disease a few weeks later at quarantine station.

Several mares bred to this stallion were also found to be diseased and were slaughtered. Other contact mares were kept in quarantine for two years, during which they were frequently inspected, but no clinical symptoms were discernible, and quarantine was terminated.

One of these contact mares was afterwards purchased by Mr. Ray Knight who bred her to several of his best stallions. This mare was the first to exhibit evidences of being affected, but the symptoms after a time gradually disappeared and animal was again put to work, although her gait remained abnormal.

Mr. Knight became alarmed when his pure-bred suffolk mares began to show peculiar symptoms and employed the services of two practising veterinarians who were unable to decide what the disease was. One suspected it was glanders and tested several mares with mallein, obtained no reaction, and concluded the disease to be a severe form of influenza. Two of these mares, which were kept in box stalls and properly cared for, died, also three which were running on range.

The stallions which had served these mares appeared in perfect health and condition, and remained in such a state for some time after disease was diagnosed. The apparent healthy condition of stallions and opinions advanced by veterinarians prevented owners from suspecting that a contagious disease existed, and would not believe it when first informed that dourine was prevalent amongst their horses.

Finally, owners were convinced and arrangements made for procuring from each mare and stallion a quantity of blood, which was delivered to and tested by Dr. Watson, pathologist in charge of research laboratory at quarantine station.

The test proved beyond a doubt that all suspected animals and a large number of apparently healthy mares and stallions were diseased.

The percentage of diseased animals was so large that I expected to meet with some opposition when I would inform owners that a number of their best stallions and mares had reacted to test, and would be destroyed. The expected opposition was not met with, due to the fact that several mares which appeared in perfect health when blood was obtained had died and a number of others had broken down with disease. I also learned that some of pure-bred stallions were beginning to exhibit unmistakable signs of being affected, which was a prominent factor in convincing owners that the disease was dourine.

Mr. Ray Knight and officials of the Knight Sugar Company rendered every assistance, and furnished every convenience possible for Inspector Busselle and myself who were detailed to perform the duties in connection with obtaining blood from suspected animals, 90 per cent of which were unbroken range horses and had to be thrown by owners before blood could be obtained.

Every important symptom of the disease was noticed in animals affected, the most predominant of which was paralysis of throat. Animals so affected when breathing made a loud harsh noise which could be heard for some distance, and when made to move would invariably choke, fall, and be unable to rise for some time. Other mares which presented symptoms, such as plaques, swollen and depigmentated vulva, incoordination, etc., always lived much longer than those affected with throat paralysis.

While obtaining blood from animals I made it a point to mark any mare or stallion which I thought presented the slightest suspicious symptoms, all of which gave a positive reaction. Mr. Ray Knight had marked several mares which he suspected to be affected, but presented no clinical symptoms. These mares, without an exception, also gave a positive reaction which proved accuracy of test to owners. Mr. R. Kinsey, chief stockman for Knight Sugar Company, says his conclusion is that the test is a reliable one or Dr. Watson is a good guesser. Kinsey also had marked several mares which he had good reason to believe were affected, all of which reacted and were destroyed.

The advantages of having such a test are many. Personally, I cannot imagine how it would be possible to even hope to eradicate a disease of this kind without its assistance. It eliminates the necessity of keeping a suspected herd in quarantine for long periods during which owners were not permitted to carry on breeding operations. In some cases it was found necessary to continue the quarantine for five years which occasioned considerable loss to breeders, the total of which cannot be easily calculated. At the expiration of these long periods, during which suspected animals were frequently examined, it was not possible to definitely state that the disease had been eradicated, therefore it was more or less a conjecture on the part of inspector when form 52 was forwarded. The amount of compensation paid for horses slaughtered in dealing with these outbreaks to some may seem great, but I don't think it would begin to compare with the sum it would be necessary to pay if the disease were dealt with on clinical symptoms only.

I believe it would continue, as in the past ten years, to manifest itself in new as well as old centers of infection year after year, and for an indefinite period. If the disease is to be eradicated the testing of all suspected and contact animals, and the slaughter of all reactors, I think is the only manner by which this desired result can be obtained.

Number of premises quarantined for dourine	10
Number of horses quarantined for dourine	2,718
Number of grade stallions and mares slaughtered	384
Number of registered stallions and mares slaughtered	19
Total number slaughtered	403
Total valuation of horses slaughtered	$60,310
Total compensation of horses slaughtered	$40,206.66

I have the honour to be, sir,

Your obedient servant,

M. V. GALLIVAN,
Inspector.

APPENDIX No. 11.

(J. A. Couture, D.V.S., Superintendent of Quarantine, Point Levis, Quebec.)

QUEBEC, March 31, 1914.

SIR,—I have the honour to send my annual report on the operations of the Point Lévis Animals' Quarantine for the last twelve months.

There were imported through this station during the past year the following animals, viz:—

Cattle	237
Sheep	458
Swine	29
Deer	2
Goat	1
Horses	11
Making a total of	738 animals.

As regards to breeds of animals and ownership, the following classification may be made:—

CATTLE.

Ayrshires—	
R. R. Ness, Howick, Que	61
Fertilizer Experimental Farm, Sydney, N.S.	4
J. D. Duncan, Montreal	28
J. J. Hill, St. Paul, Minn., U.S.A.	12
Total	105
Shorthorns—	
J. B. Tiffin, Vancouver	1
Macdonald College	10
Mitchell Bros., Burlington, Ont.	5
John Graham, Carberry, Man.	4
Prof. G. E. Day, Guelph, Ont.	12
J. J. Hill, St. Paul, Minn., U.S.A.	27
Frank Cockshutt, Brantford, Ont.	6
Total	65
Jerseys—	
T. A. Cox, Brantford, Ont.	3
B. A. Bull, Brampton, Ont.	35
Total	38
Guernseys—	
B. A. Bull, Brampton, Ont.	5
Galloways—	
C. H. Hetchner, Chariton, Iowa	13
Shetland—	
W. H. Head, Vancouver, B.C.	5
West Highland—	
R. R. Ness, Howick, Que.	3
Polled Angus—	
J. J. Hill, St. Paul, Minn.	3
Total	29
Grand total	237

SHEEP.

Shropshire—	
T. A. Cox, Brantford, Ont	27
Wm. Butler, Shifnel, Eng	66
J. J. Hill, St. Paul, Minn	22
Wm. Cooper and Nephews, Chicago, Ill	2
Total	117
Dorset—	
John Milton, Portland, Oregon	104
Wm. Cooper and Nephews, Chicago, Ill	6
Total	110
Hampshire—	
T. A. Cox, Brantford, Ont	8
John Milton, Portland, Oregon	61
Wm. Cooper and Nephews, Chicago, Ill	6
Total	75
Cheviot—	
Macdonald College	30
Lieut.-Governor Brown, Regina, Sask	10
Total	40
South Down—	
T. A. Cox, Brantford, Ont	13
Wm. Butler, Shifnel, Eng	1
Guy Drummond, Montreal	24
Total	38
Oxfords—	
T. A. Cox, Brantford, Ont	15
J. J. Hill, St. Paul, Minn	22
Total	37
Leicester—	
R. R. Ness, Howick, Que	10
Wm. Butler, Shifnel, Eng	1
Jas. Douglas, Caledonia, Ont	3
H. Smith, Camrose, Alta	20
Total	34
Cotswold—	
Wm. Butler, Shifnel, Eng	7

SWINE.

Berkshire—	
F. Cockshutt, Brantford, Ont	2
T. A. Cox, Brantford, Ont	25
Yorkshire—	
Prof. G. E. Day, Guelph	2
Total of swine	29

DEER.

Light Grey—	
Mrs. Ethelwyn McGibbon, Montreal	2

GOATS.

Major W. R. Digby, Vancouver, B.C	1

HORSES.

Grade pony gelding—J. Burstall, Quebec	1
Welsh ponies—Wm. Butler, Shifnel, Eng.	3
Highland pony—Sir Chas. Fitzpatrick, Ottawa	1
Shetland ponies—W. H. Head, Vancouver, B.C.	2
Hackney ponies—R. A. Snowball, Chatham, N.B.	2
French coach—Ecole d'Agriculture de Ste-Anne de la Pocatière	1
Clydesdales—R. A. Snowball, Chatham, N.B.	1
Total	11

The following is a list of the importers showing the number and kind of animals which they imported:—

Lieut.-Governor Brown, Regina, Sask.	10 Cheviot sheep.
Bull, B. A., Brampton, Ont.	35 Jersey cattle.
	5 Guernsey cattle.
Butler, Wm., Shifnel, Eng.	1 Leicester sheep.
	1 South Down sheep.
	7 Cotswold sheep.
	66 Shropshire sheep.
	3 Welsh ponies.
Burstall, J. F., Quebec	1 grade pony.
Cox, T. A., Brantford, Ont.	3 Jersey cattle.
	25 Berkshire swine.
	8 Hampshire sheep.
	13 South Down sheep.
	15 Oxford sheep.
	27 Shropshire sheep.
Cockshutt, Frank, Brantford	2 Berkshire swine.
	6 shorthorn cattle.
Cooper, Wm. and Nephews, Chicago, Ill.	2 Shropshire sheep.
	6 Dorset sheep.
	6 Hampshire sheep.
Douglas, James, Caledonia, Ont.	3 Leicester sheep.
Duncan, J. D., Montreal	28 Ayrshire cattle.
Day, Prof. G. E., Guelph, Ont.	12 Shorthorn cattle.
	2 Yorkshire swine.
Drummond, Guy, Montreal	24 South Down sheep.
Digby, Major W. R., Vancouver	1 goat.
Ecole d'Agriculture, Ste-Anne de la Pocatière	1 French coach horse.
Fertilizer Experimental Farm, Sydney, N.S.	4 Ayrshire cattle.
Fitzpatrick, Sir Chas., Ottawa	1 Highland pony.
Graham, John, Carberry, Man.	4 Shorthorn cattle.
Hill, J. J., St. Paul, Minn.	27 Shorthorn cattle.
	12 Ayrshire cattle.
	3 Polled Angus cattle.
	22 Oxford sheep.
	22 Shropshire sheep.
Hetchner, C. H., Chariton, Iowa	13 Galloway cattle.
Head, W. H., Vancouver	5 Shetland cattle.
	2 Shetland ponies.
Mitchell Bros., Burlington, Ont.	5 Shorthorn cattle.
Milton, John, Portland, Oregon	61 Hampshire sheep.
	104 Dorset sheep.
McGibbon, Mrs. Ethelwyn, Montreal	2 deer.
Macdonald College	10 Shorthorn cattle.
	30 Cheviot sheep.
Ness, R. R., Howick, Que.	10 Leicester sheep.
	3 West Highland cattle.
	61 Ayrshire cattle.
Smith, Herbert, Camrose, Alberta	20 Leicester sheep.
Snowball, R. A., Chatham, N.B.	2 Hackney ponies.
	1 Clydesdale horse.
Tiffin, J. B., Vancouver, B.C.	1 Shorthorn cattle.

Of the 738 animals imported 460 were for Canada and 278 for the United States, as follows:

	For Canada.	For United States.
Cattle—		
Ayrshires	93	12
Shorthorns	38	27
Jerseys	38	
Galloways	..	13
Guernseys	5	
Shetlands	5	
West Highlands	3	
Polled Angus	..	3
Total	182	55
Sheep—		
Shropshires	93	24
Dorsets	..	110
Hampshires	8	67
Cheviots	40	
South Downs	38	
Oxfords	15	22
Leicesters	34	
Cotswolds	7	
Total	235	223
Swine—		
Berkshires	27	
Yorkshires	2	
Total	29	
Deer	2	
Goats	1	
Horses	11	

DISTRIBUTION BY PROVINCES.

The 460 animals imported for Canada were distributed by provinces as follows:—

	Total.	
Nova Scotia—		
Cattle—Ayrshires	4	
		4
New Brunswick—		
Horses—Hackney ponies	3	
		3
Quebec—		
Horses—French coach	1	
Pony	1	
Cattle—Ayrshires	89	
West Highlands	3	
Shorthorns	10	
Sheep—South Downs	24	
Cheviots	30	
Leicesters	10	
Deer	2	
		170
Ontario—		
Horses—Welsh ponies	3	
Highland pony	1	
Cattle—Shorthorns	23	
Jerseys	38	
Guernseys	5	
Sheep—Shropshires	93	
Leicesters	4	
South Downs	14	
Cotswolds	7	
Hampshires	8	
Oxfords	15	
Swine—Berkshires	27	
Yorkshires	2	
		240

Manitoba—		
Cattle—Shorthorns	4	
		4
Saskatchewan—		
Sheep—Cheviots	10	
		10
Alberta—		
Sheep—Leicesters	20	
		20
British Columbia—		
Horses—Shetland ponies	2	
Cattle—Shorthorn	1	
Shetland	5	
Goat	1	
		9
Grand total		160

TUBERCULIN TEST

Of the 237 cattle imported, 55 were tested in England which were consigned for the United States; 2 died before being tested; the testing of 7 was postponed and there were 12 calves under age, leaving 161 which were tested at this quarantine. Of that number 15 reacted and 2 were doubtful.

BIRTHS AND DEATHS.

There were 15 calves born in quarantine, 1 Shetland colt and 2 Dorset lambs, total 18.

There were four deaths, being 2 Jersey cows and 2 lambs.

I have the honour to be, sir,

Your obedient servant,

J. A. COUTURE,
Superintendent.

APPENDIX No. 12.

(J. H. Frink, V.S., Inspector and Superintendent of Quarantine, St. John, N.B.)

SIR,—I beg to submit report covering work at this station for the year just closed.

INSPECTION IMPORT STOCK.

The total number of horses imported into Canada by this port totals 271: 230 imported from Glasgow, 7 from London, 3 from Antwerp, 1 from Liverpool, and 30 from United States.

Made up of the following breeds and classes:—

From Great Britain—	
Clydes	130
Shires	9
Suffolks	5
Welsh ponies	17
" geldings	4
Shetlands	42
Hackney stallions	9
" mares	17
" geldings	1
Saddle geldings	4
	238
From continent—	
Percherons	3
From United States—	
Work and driving	26
Trotting bred	1
Standard bred	3
	30

Summary—	
From Great Britain	238
From continent	3
From United States	30
Total	271
Imports cattle, sheep and swine from Great Britain—	
Cattle, Shorthorns	2
Sheep, Leicesters	3
" Suffolk Down	2
" Cheviots	3
Hogs, Yorkshire	9
Total	19
Imports from United States—	
Sheep, Cheviots	1
" Lincolns	315
Hogs, Mule Foot	6
Total	322

These animals were inspected, and those quarantined found necessary under regulations governing animals quarantine.

QUARANTINE.

Very few animals have been admitted to quarantine during the year owing in great part to the restriction placed upon the movement of ruminants and swine from Great Britain. The buildings and grounds have been well maintained at quarantine and at present are sufficient for all requirements at this port. Some changes in the arrangement of facilities at quarantine are contemplated which will add to the efficiency of the station.

EXPORT OF LIVE STOCK.

This once flourishing business at this port has almost collapsed and there is no evidence of the resumption. The removal of customs duty on Canadian cattle imported into the United States is increasing, and the too-limited number of cattle in this province is being still further diminished.

Experts to Great Britain from this port:—
500 United States sheep.
1 horse

To South Africa:—
75 mules.
15 horses.

IMPORTS OF HORSES.

Date.	Owner.	From.	No.
	Welsh Ponies.		
April 2	T. H. Hazzard	Glasgow	10
" 22	Hugh Mair	"	1
Jan. 8	John Miller	"	8
	Trottingbred.		
April 15	W. H. Miller	Boston	1
Feb. 18	J. Douthought	"	1
March 24	Thos. Hayes	"	1
	Hackney.		
April 22	F. Cockshutt	Glasgow	1
" 22	M. Mansell	"	4
" 22	T. A. Cox	"	11
	Shire.		
April 22	T. A. Cox	Glasgow	1
Jan. 2	T. Rawlinson	London	7
Feb. 11	T. Bury	Glasgow	1
	Ponies.		
Feb. 11	T. A. Cox	Glasgow	12
	Standard bred		
Nov. 4	W. A. Cairns	Boston	1

INFECTIOUS DISEASES.

GLANDERS.

Inspections and tests have been made for the detection of glanders in many instances, and reactors found in only one importation of working horses from the United States. These animals had been subjected to the mallein test before being shipped from United States. The test charts not being satisfactory they were tested here with above results. Tests have been made of suspects within the province but no disease found. The reactors found at boundary points and information thereto will be found in boundary inspectors returns.

HOG CHOLERA.

An extensive outbreak of this disease was found near Moncton, N.B., in January, occurring among a lot of slaughter-house hogs, which had been fed on uncooked garbage. The disease was confirmed on post-mortem, and having been thus established, Inspector McCuaig was placed in charge and all regulations and orders were strictly carried out. Inspections were made of herds of hogs in the vicinity, but no disease was found, and there has been no evidence of further trouble in the district. The importation of hogs from an infected farm, in the province of Quebec to New Brunswick necessitated the placing of two large establishments under quarantine. The suspected animals and those in contact gave no evidence of disease after three months and were released.

ANTHRAX.

Inspections for this disease were made on reports submitted. These were not confirmed in any case, by post-mortem or microscopical examination.

MANGE.

A report of an outbreak of mange in cattle was made from a parish in Nova Scotia. On investigation the report was not proven and found due to deranged digestion causing skin eruption and aggravated by continuous applications of irritants and absorption of lead from paints.

TUBERCULOSIS.

Inspection and test of cattle for export to United States were made and have been duly reported upon. The use of tuberculin has fallen largely into disuse and there appears to be a reasonable calm in the discussion of milk values and dangers in their relation to public health.

CAR INSPECTION AND CLEANSING AND DISINFECTION.

This work has been carried on as usual, the work falling on the caretaker at quarantine.

Respectfully submitted,

JAMES H. FRINK,
Inspector

APPENDIX No. 13.

(C. H. Higgins, D.V.S., Pathologist in charge, Biological Laboratory, Ottawa.)

OTTAWA, March 31, 1914.

SIR,—I have the honour to transmit this, my fifteenth annual report as an officer of the department, my twelfth as its pathologist.

During the year the work of the laboratory has been more exacting than at any previous period since its organization. The various phases of the work have shown progress proportionate to the amount of time severally allocated to each.

Accommodation was provided during the year for the suitable housing of our small animals. This provision has proven very convenient as we have never before been able to keep an adequate supply of animals for emergency work which at any time may present itself.

Besides supplying all of the small animals that have been required for our own work, we have, at your direction, provided fifty of these animals for the work of various institutions at a nominal charge. Further than this, we have provided one hundred for work at the Lethbridge laboratory. Our stock fluctuates according to the requirements of our work but we usually have on hand about five hundred guinea-pigs and ten rabbits.

The growth of certain features of our work indicates the desirability of our having accommodation for large animals. While certain limited accommodation is now available, the building supplying this is constructed entirely of wood, making adequate disinfection very difficult. We have in the past experienced no untoward results from its use, nevertheless, the anxiety would be greatly lessened if the construction were of an impervious material.

LABORATORY STAFF.

The staff during the year has been similar to that of the preceding year with the addition of Mr. N. M. Guiou who was employed during the summer months. He was engaged in collaboration with myself and Dr. Wickware in the investigations on entero-hepatitis or black-head in turkeys concerning which more will be said later in this report. Dr. Wickware was absent for the purpose of assisting the work of the laboratory at Lethbridge from April 26, 1913, to August 26, 1913, and again on leave from October 16, 1913, to March 3, 1914, inclusive. During this later period he was taking up work in other laboratories.

Dr. Reid was absent during the first of the year assisting the Faculty of Comparative Medicine of Laval University in Montreal.

I was permitted to attend the fiftieth anniversary meeting of the American Veterinary Medical Association held at New York in September last, where I again had charge of the section on Sanitary Science and Police. I have been asked to assume a similar responsibility for the next annual meeting which is to be held in New Orleans next December.

In December last, I attended the meeting of the American Society of Bacteriologists held in Montreal.

My time has been fully occupied during the year in connection with the various products manufactured, the details of all of which I have personally assumed, save the experimental strangles vaccine which has been in the hands of Dr. Evans. Aside from the exacting duties connected with this manufacture, I have undertaken many original

investigations connected with specific problems arising in connection with the routine or with special problems presented by other departments or branches of the government service. Many of these investigations are still in an incomplete stage while others are of such a nature that they have been dealt with in special reports which are not of general interest and will not therefore be dealt with in detail in this report. Certain of these investigations have been undertaken in collaboration with other members of the laboratory staff and are presented herewith as appendices to this report in the form of special articles.

During the year, at your request, every opportunity has been afforded Dr. Evans to pursue his inquiry into the subject of contagious abortion in cattle. During the latter part of the year his findings have promised so much, and the demands of this special work upon his time have been so great that I have relieved him, in so far as this has been practicable, of all duties connected with other work of the laboratory. That this has resulted in some personal inconvenience to Dr. Reid and myself in the absence of Dr. Wickware, is apparent from the vast amount of work that has been required in connection with the routine. This has gladly been undertaken and I believe that the results achieved by Dr. Evans have warranted the inconvenience thus necessitated. Personal inconvenience to Dr. Evans has also been a feature of the special investigations with which he has been charged, for at times, particularly when carrying to a conclusion special work connected with the newer methods of diagnosis, and modifications which may from time to time be decided upon, render it necessary for the investigator to practically live with his work continuously through the whole of a number of days.

The scope of the work on contagious abortion has been limited as certain preliminary work was first necessary, but it now seems that the time has arrived when we should, with the results now available, enlarge its scope with a view of arriving at some suitable means for its practical treatment or prevention. Such work can only be carried out on the larger animals and I believe that the time is opportune for us to undertake a comprehensive experiment under conditions which will permit the control of all factors connected therewith. The findings in connection with the work of Dr. Evans will be found in Appendix No. 1 of this report.

Dr. Evans has also been engaged in the preparation of experimental strangles vaccine for the prophylactic treatment of horses which may be exposed to this infection. It is yet too early to draw any definite conclusions from the results that have been secured from its use, nevertheless the indications are that it has some value in dealing with a very troublesome malady of horses. Dr. Evans has compiled the data available which will be found in appendix No. 2 of this report.

Dr. Wickware has undertaken many of the investigations arising in connection with the routine examination of material forwarded for diagnostic purposes. In this regard he has had an exceptional opportunity to study the various methods used in the diagnosis of rabies in which he has become most proficient. An article covering the work which has been conducted with this affection has been compiled by him and is attached hereto as an appendix to this report (Appendix No. 3). He has also assisted in compiling the data on hand at the laboratory in connection with our work on tuberculosis in poultry which is prepared in a form suitable for a bulletin, which may be used in an endeavour to assist in the control of this very serious malady among poultry (Appendix No. 4). The special article on entero-hepatitis or black-head in turkeys (Appendix No. 5) is the result of the joint efforts of Dr. Wickware, Mr. Guiou, and myself. Prior to the special employment of Mr. Guiou in this connection, Dr. Wickware and myself have assumed the responsibility for the detail work connected with these investigations.

Other features of his work relate to the purely pathological examinations which as formerly have been of a very satisfactory nature. Some of the pathological material

which has been accumulating for many years is very valuable, and I anticipate that Dr. Wickware will in the near future find time for working it up in such a manner as to increase its usefulness.

As already stated Dr. Wickware was absent from this laboratory from April 26 to August 26, during which time he was assisting in the work at the Lethbridge laboratory and on leave from October 16, 1913, to March 3, 1914.

Dr. Reid has been on duty continuously throughout the year save during the period when his services were made use of by the Faculty of Comparative Medicine of Laval University in Montreal, for which purpose he was granted leave. Every assistance was rendered this institution by the laboratory and quite a number of specimens were forwarded for the fuller demonstration of Dr. Reid's lectures. During the year Dr. Reid has been especially charged with the periodical examinations of the water supply of the various government buildings. Many interesting details have developed in connection with this work. During Dr. Wickware's absence he has undertaken a large portion of the routine examinations and in this connection his services have been very satisfactory. He has made some interesting findings in connection with this routine work and some of these details will later be available for publication.

Mr. N. M. Guiou was employed continuously from April first to November first. His services were utilized in connection with the experiments on entero-hepatitis or black-head in turkeys. Many facts were secured in the pursuit of this work some of which are presented in a special report which has been prepared and appended hereto as an appendix to this report (Appendix No. 5).

The caretaker, Mr. Fee has rendered excellent service throughout the year, proving as usual, very capable in the handling of the small and such other duties as have from time to time been assigned to him.

Mr. Paquette has attended to the clerical work of the laboratory and, when not fully employed at such duties, his services have been utilized with features of the routine requiring attention.

Mr. Abraham has, aside from aiding Mr. Fee in his multifarious duties, been employed in bottling such products as we have disbursed, other than anthrax and black-leg vaccines and has proven careful in this work.

BIOLOGICAL PRODUCTS.

The manufacture of biological products has continued through the year, each presenting its own problems of which little mention need be made at this time. Your decision to disburse these from your office which is much more advantageously situated for the purpose than is the laboratory, has relieved us of some of the detail work in connection with these products. It has also removed the possibility of mistakes occurring, a feature which occasionally happened prior to this change, as the space intervening between your office and the laboratory necessitated the transmission of names and addresses by telephone. With the disbursements, which have taxed the available staff, we would have found it impossible to cope with the necessities of the work in this regard but for the special labour-saving devices which have been designed for performing various phases of our work.

MALLEIN.

The mallein disbursements for the year show a falling-off, a very favourable indication that cases of actual and suspected glanders are on the decline. The methods employed in its manufacture have not varied from those in vogue during previous years and need not be considered further at this time.

The total disbursements for the past five years are as follows:—

——	1909-10.	1910-11.	1911-12.	1912-13.	1913-14.
April	2,905	9,041	295	2,438	170
May	3,525	3,815	2,940	4,417	4,877
June	1,440	4,280	4,555	2,201	435
July	2,191	4,655	7,595	4,254	3,769
August	1,660	2,720	3,735	1,890	1,255
September	2,700	2,320	4,395	1,984	610
October	2,670	3,005	4,295	2,305	3,600
November	2,850	3,281	3,175	2,268	1,500
December	1,085	1,920	860	1,234	3,000
January	1,760	2,405	4,660	3,239	2,000
February	2,290	2,640	3,360	3,001	.....
March	7,950	10,030	8,015	8,045	2,000
	32,996	50,112	47,880	37,276	23,216

TUBERCULIN

The disbursements of tuberculin for the year as can be seen by referring to the table given below have remained much the same as for the preceding year. The details in this connection for the past five years are as follows:—

——	1909-10.	1910-11.	1911-12.	1912-13.	1913-14.
April	648	654	673	1,023	908
May	418	1,178	810	1,196	1,951
June	496	568	505	620	900
July	887	432	645	770	1,385
August	760	544	185	958	724
September	335	632	477	549	1,245
October	474	381	632	1,410	1,800
November	561	801	1,340	1,573	1,500
December	488	621	420	1,426	1,050
January	282	1,087	899	1,352	1,000
February	634	561	420	761	.....
March	617	797	957	1,622	250
	6,600	8,253	7,963	13,260	12,808

BLACK-LEG VACCINE.

This vaccine has been prepared as formerly and as will be seen by the figures given below, the disbursements for the current year are greatly in excess of any previous year. This is doubtless due to the fact that our vaccine is becoming better known.

We have in one instance prepared a special vaccine for an outbreak which appeared to be due to an organism of a slightly different variety and in connection with which there was some question as to the degree of resistance afforded by our stock vaccine. I believe it to be desirable to undertake such work when any question arises in this connection, as it not only affords the opportunity to improve our stock vaccine but also to meet what otherwise is quite likely to develop into an antipathy toward the product prepared at this laboratory. The full details connected with this special vaccine have been dealt with in special reports and need no further mention at this time.

The disbursements for the past five years are given hereunder:—

—	1909-10.	1910-11.	1911-12.	1912-13.	1913-14.
April	1,330	843	2,076	2,140	5,739
May	1,114	2,013	826	2,478	2,900
June	1,714	2,866	463	4,966	4,147
July	1,007	678	416	1,205	563
August	310	427	1,023	1,292	462
September	899	569	1,328	658	2,461
October	300	4,094	1,019	1,398	7,978
November	788	1,801	568	405	7,485
December	380	345	463	950	5,560
January	136	147	55	241	...
February	4,761	380	188	1,240	400
March	730	3,106	1,085	3,475	14,180
	13,469	17,264	9,510	12,448	50,971

ANTHRAX VACCINE.

This vaccine, while used in very small quantities, is still kept on hand in limited amounts for such emergencies as may from time to time arise. While the cost of preparation is greatly in excess of the return, it seems desirable for us to maintain a supply for such requirements as may from time to time arise.

The disbursements for the past five years are as follows:—

—	1909-10.	1910-11.	1911-12.	1912-12.	1913-14
April	...	21	56	...	28
May	38	70	60	50	110
June	112	...	200	50	...
July	47	36	412	116	310
August	40	...	40	57	...
September	62	...	240	52	...
October	17	32	12	...	...
November	...	...	...	...	...
December	...	...	...	62	...
January	...	...	6	20	...
February	...	...	330	...	...
March	70	95	...	...	...
	386	254	1,356	407	448

STRANGLES VACCINE.

This vaccine as has already been indicated has not passed beyond the experimental stage, insofar as its routine preparation and disbursement are concerned. Some four thousand doses have been forwarded to your office for distribution among veterinarians. We see no insurmountable difficulty in adding this to the list of products regularly supplied by the laboratory, either as now prepared or in some modification which further experience may determine. The details connected with its preparation have been in the direct charge of Dr. Evans of the laboratory staff and are included as a portion of this report. (See appendix No. 2.)

A marked increase in the general routine of the laboratory has been noted during the year just ended. There were examined 1,707 series of specimens as compared with 1,399 series, for the year immediately preceding.

Certain features of the work will admit of special mention, while other features of less importance and of little general interest will be omitted.

ABORTION.

This affection as seen in cattle is being dealt with in a special article by Dr. Evans who has had this work in hand, and therefore needs no further mention at this time. Readers are referred to this article which will be found as Appendix No. 1 to this report.

ENTERO-HEPATITIS.

The progress made with this disease during the year was greater than for a like period during any preceding year. This may be accounted for through the accumulated experience of the laboratory staff and the fact that Mr. Guiou was able to give this work a greater amount of attention during his employment than has been possible by any other member of the staff during a similar period. We are making progress in this work and it is to be hoped that with the data already available together with the more comprehensive scheme on which the investigations are to be conducted, that another season will see a considerable advance over our present knowledge.

The reader is referred to Appendix No. 5 for details in this connection. It is impossible for us to include in this special report many of the minor experiments which we have conducted as some of these require still further observations for their full corroboration and this data may be looked for at a later date.

FOXES.

The services of the laboratory have been requisitioned to assist the newly developed fox industry in overcoming some of their losses. As each individual animal is valued at a very high figure, the prevention of any losses means a considerable financial gain, not only to the party or parties directly concerned but to the live-stock industry as a whole. To advise with respect to the prevention of deaths occurring at remote points among wild animals in captivity is a very difficult task. While we are able to arrive at the cause or causes which result in the death of an individual, we cannot advise what methods are required to overcome the conditions which result in such losses.

Each case has been dealt with through the medium of a special report and, therefore, requires no further mention at this time.

STERILIZATION OF PAPER CURRENCY.

Under the provisions of the Bank Act, passed in June, 1913, provision was made for the adoption of regulations providing for the sterilization by the banks of notes used as currency. To comply with the provision above set forth, this laboratory was requested to undertake the examination of notes in this connection.

We have completed our experiments, and I may here express my appreciation for the marked interest taken during its progress by Mr. J. E. Rourke, Comptroller of Currency for the Finance Department. Without the suggestions which he has from time to time been able to offer, we would have been unable to thoroughly understand some of the features having a very important bearing on the work. It is gratifying to note that as a result of our investigations into this problem, Mr. Rourke has been able to have a device constructed which adequately meets the demands of the situation.

It is not our purpose to enter into the details of the experiments undertaken, as these are very technical in their nature, and have been the subject of special reports transmitted to the Finance Department through your office.

It may be of interest to mention that the main conclusion reached as a result of experiments extending over a period of some months was that practical requirements would be met by the subjection of notes to heat at 80° C. for a period of four hours, this being sufficient to destroy the vitality of the infective agents commonly transmitted from man to man by fomites. This temperature would not, however, destroy the spores of anthrax or tetanus.

The work was checked by infecting notes with a very virulent form of *staphylococcus pyogenes aureus* (*Aurococcus*) and subjecting these in a special electric sterilizing device which Mr. Rourke had constructed for the purpose. This having been found efficient in destroying the infection with which we were experimenting, it was but natural for us to reach the conclusion above recorded, namely that an exposure to 80° C. for four hours would destroy the vitality of the organisms most liable to transmission through the medium of paper currency.

This special device was operated at the laboratory for over a month, during which time a record of the temperature was kept, and the fluctuations were found to be less than two degrees centigrade. This is within the limits of safety, as notes subjected to a slightly higher temperature than that decided upon for a period of two weeks failed to show a deterioration in the fibre of the paper or in the permanency of the ink.

POULTRY.

Our poultry work has been continued on much the same lines as those which have been pursued during former years. The calls for this work are increasing, and I believe that this indicates that there is a fuller appreciation of the benefits to be derived from learning the exact cause of unthriftiness and death in given instances. It is but natural that as our experience in this connection has increased we have become more expert in our examinations and thus better able to assist interested parties.

We append hereto as Appendix No. 3, a special report covering the work with tuberculosis in poultry, and our recommendations in connection therewith. We have also prepared our results with entero-hepatitis or black-head in turkeys in the form of a special report, which will be found as Appendix No. 5 of this report. With the latter we append our conclusions, which may be of interest to those engaged in turkey raising.

We have performed a large number of autopsies on fowl that were specially fed with weed seeds by the Poultry Division of the Experimental Farms Branch. In the main, our findings resulted in the conclusion that none of the seeds being used could be considered as distinctly poisonous. Certain varieties, however, checked the growth of the birds in question, while one variety gave results which indicated that it was equally as efficacious in increasing the weight of birds as the best food obtainable. The full data of our work in this connection are contained in a special report covering the whole subject, and, as it is of little value without the data secured by the Poultry Division for purposes of comparison, it is not included as a portion of this report. Mr. Elford advises me that he proposes including the data secured by us in a special report which he is preparing, and to which the reader is referred.

As a result of our examinations of poultry, and the observations which we have from time to time made, we have been led to the conclusion that there is too little at present known about the physiology of the digestive function in these animals. It is our belief that when this question is actively considered, that it will be found that the cæca or *blind guts*, exert a marked effect upon the digestive process. Just what this effect is can only be determined by accurately conducted experiments, and we mention our belief here with a view of stimulating some investigator who will have the time and inclination to consider this problem with a view of aiding in its solution.

The pathology of poultry diseases is gradually becoming a more and more important problem. This is largely the result of the increased attention which is being given to the improvement of the industry through breeding a higher type of fowl for the purely commercial features of the poultry business. Fowls bred to lay are commanding enormous figures, and will continue to do so until the average fowl is a high producer. With this increased productiveness along a given line, there is a marked tendency to undermine the constitution of the bird in some vital factor, with the result that the individual bird is useless, or succumbs to the most minor infection. Greater attention will necessarily have to be given to the purely physiological and pathological considerations than has heretofore been thought necessary. In this regard we anticipate that we will be able to make some progress owing to the fact that the Poultry Division of the Experimental Farms Branch is desirous of co-operating in this work with a view of reducing the preventable losses which are excessive. The many problems presented require investigations being conducted at first hand and we anticipate that this will be possible during the coming year to a greater extent than at any previous period.

WATER EXAMINATIONS.

Examinations of water have been conducted as during former years. These have been carried out as a routine procedure in determining the efficiency of the special sterilizing machines installed in the various government buildings. We have failed to find one of these machines giving anything but satisfactory results when properly installed. In one instance some trouble was experienced which was found to be due to the existence of a by-pass valve which could be opened in emergencies. With an increase in the capacity of the machine and the elimination of this by-pass no further trouble has been experienced.

TUBERCULOSIS.

During the year a considerable amount of experimental work with this disease has been conducted in connection with the routine. The major portion of the experiments which have been started are as yet incomplete, and therefore cannot be reported in detail at this time. We have also in hand some experimental data concerning the viability of the tubercle bacillus under varying conditions, both in cultures and tissues. These naturally require a considerable period of time to elapse in order that sufficient data covering many minor points may be completed.

Dr. Reid has found in the routine examination of specimens that tuberculosis has been the cause of specific lesions in sheep on two occasions. He is securing further data in this connection which will at some later date be available.

In closing my report, I desire to express my appreciation of your interest in the work of the laboratory and the encouragement which you have from time to time offered for increasing the efficiency of various phases of our work.

I have the honour to be, sir,

Your obedient servant,

C. H. HIGGINS
Pathologist.

APPENDIX No. 14.

(T. C. Evans, V.S., Assistant Pathologist, Ottawa.)

EPIZOOTIC ABORTION INVESTIGATIONS.—(INTERIM REPORT.)

The primary investigation into the disease known as Contagious Abortion in cows commenced in the spring of last year.

A previous letter covers bacteriological examination of uteri of pregnant cows at the Toronto and Montreal abattoirs. It was desired to ascertain whether it was possible to obtain a culture of the bacillus of Bang from the uterine contents of these animals in various stages of gestation. With this end in view, over 140 cases were examined, and material from each one brought to the laboratory for inoculation and cultural purposes.

In none of our plantings was it possible to identify colonies resembling those described by workers on this disease, and as many as 95 per cent of our culture tubes showed no growth at the end of four weeks incubation. Aspirations from the inner surface of the uterus and from the viscera of the foetal calves were sown directly upon the surface of the tube media while at the abattoirs and brought back to the laboratory for incubation.

During the early part of the summer I proceeded to London, Ont., to inquire into a report upon an alleged outbreak of epizootic abortion, occurring among certain herds of cattle in that district. A number of farms were visited, and a list made to determine the extent of the losses in this connection. During the two weeks stay in this locality no new cases presented themselves and I returned to Ottawa without being able to secure any material for the furtherance of our work.

The results in both the above instances are dealt with in detail in letters to you and therefore it would not seem necessary to enter into particulars here any more than to mention that up to that period we were without positive evidence of the disease in Ontario.

We were very fortunate in being able to continue the work last fall close at home within a few miles of the laboratory, owing to an outbreak of contagious abortion occurring in the neighbourhood. Later in December, two veterinarians, Dr. Hollingsworth, Municipal Food Inspector, and Dr. Harris, a practitioner, both of Ottawa, reported the existence of this disease in two dairy herds supplying milk to the city. Although rather unfortunate from the farmer's point of view, to say the least, it undoubtedly benefited the work and was the means of supplying an abundance of material from which the bacillus of Bang was isolated.

The microbe of contagious abortion of cows presents remarkable biological characteristics. The many difficulties attending its early cultivation in pure culture, have been vouched for by many workers. However, in a thoroughly equipped laboratory, with proper apparatus, these difficulties are easily overcome.

The winter had fairly well settled in before the commencement of this work, and we were hampered to some extent by inclement weather and bad roads. It was really intended to show in a more comprehensive way the results following injections of city milk into guinea-pigs in order to demonstrate that the abortion bacillus does exist in the milk of aborting cows, and is pathogenic to guinea-pigs. This experiment proved successful and we obtained pure isolations from guinea-pigs dying from this source.

Later milk inoculations had to be discontinued owing to insufficient heated accommodation in our building. We ran no risk of infecting our healthy stock and kept all milk inoculated pigs entirely segregated from the breeding house.

In the results following the inoculation of guinea-pigs with milk, 10 per cent of the deaths were due to excessive cold alone. It is desired that a thorough series of experiments with milk from various dairies supplying raw milk be made this spring and summer in the endeavour to determine if the bacillus of abortion be present in any of these supplies and if so in how many.

The outbreak of abortion previously referred to existed in the herds of four dairy farms, all within a radius of 12 miles of Ottawa. The only explanation which could account in any way for the introduction of the disease into these herds was the purchase of a cow from premises which were believed to have been infected several years before. This cow no doubt was the nucleus for the infection and, before any clinical signs were apparent, two heifers were sold to another dairyman who later on developed abortion in his herd. Both of these herds were free from the disease previous to last summer.

The paper of Schroeder and Cotton on the presence of the etiological factor of contagious abortion in the milk of aborting cows is responsible for our using the milk as material for inoculation. Other vehicles were the placenta cotyledons and the viscera of the aborted fœtus, from which pure cultures were obtained by plantings.

PHYSICAL PECULIARITIES.

Experiments have demonstrated that the bacillus of Bang is one that is neither aerobic nor anaerobic. According to Nowak it occupies a position between the two. For a successful growth it requires only a certain amount of oxygen and unless this condition is provided, it is slow to develop in the primary plantings. While the majority of our early cultures were obtained under the Nowak method, we did obtain growths in tubes from stomach plantings where the growth appeared on the solid surface of the media without us altering the atmospheric content. Rubber caps were placed upon these tubes to prevent evaporation, and they were incubated in the ordinary way at 37° C. for three weeks.

MATERIAL.

All material from aborting cows was brought to the laboratory with as little delay as possible, except on days when the condition of the roads rendered travelling difficult. It was found that freezing of the fœtus for a period of from a few days to two weeks did not destroy the bacillus, as most of our material was frozen when arriving at the laboratory. Some of our material had been subjected to a temperature of 20° below zero; such had to be thawed before aspirations from the abdominal viscera could be obtained. In cows where the afterbirth was retained and it was desired to obtain material therefrom it was usual to remove same under strict aseptic conditions. Small pieces of the placenta cotyledon were cut off and placed in sterile vials, brought to the laboratory, together with a sample of the milk and the fœtus.

Microscopic examination of smears made from the degenerative material of the placenta generally showed the presence of the abortion bacteria in great numbers. Slides from the stomach contents seldom exhibited the presence of the bacillus on microscopical examination, although plantings from the same source often gave positive results in the culture tubes.

CULTIVATION.

Bang was successful in obtaining isolations from the foetal heart blood, various portions of the viscera and from the inner surface of the uterus. The media used in the work for isolating the organism in this laboratory were Stribolt and Nowak's gelatin-serum-agar. Later, in a few instances, we have been using a 1 per cent glycerin-grape-sugar-agar with good results. For successive generations the ordinary media such as are used in laboratory routine grow the bacillus well.

The tubes and plates are placed in ordinary specimen jars with a tight-fitting ground cover or in a wide-mouthed bottle fitted with a pure rubber stopper. To provide favourable atmospheric conditions, the bacillus subtilis, a vigorous aerobe, is cultured together with the abortion tubes and plates in the jars. The bacillus subtilis requires oxygen for its growth and absorbs a certain amount from the air in the jar according to the surface of growth and the amount of space in the jar. The usual allowance is one square centimetre of the subtilis to fifteen cubic centimetres of space.

The length of time it takes for the colonies to develop varies. In some instances they are apparent to the naked eye in four days although in some cases it was as long as ten days before they were observed. On the surface of the medium they appear as small transparent drops of water, with a shimmering greenish cast. Transplanted in the third and fourth generation, this transparency is lost and the colonies assume more of a rusty colour.

MORPHOLOGY.

Slides made and stained reveal a small bacillus not unlike the organisms of bovine tuberculosis. With dilute carbolic fuchsin the staining is uneven and granular. It does not retain the dye in the presence of acid or alcohol. The bacillus stains with all the common dyes. It is non-motile and does not retain its stain when treated with the Gram method.

LATER CULTURES.

Our cultures possessed a retarded growth on culture media in the incubator for a number of generations. After several weeks, however, they seem to accommodate themselves to the artificial environment, and grow fairly rapidly.

A good growth was obtained in a 1 per cent glycerin-sugar broth after the fourth transpant. Potato solid media is also excellent, and gives vigorous growths. In flasks where the air has been replaced by coal gas and CO_2 it also flourished.

GOATS.

The theory held by many farmers and stockmen that the presence of a goat among cows prevents this disease was responsible for an experiment worth recording. The efficiency of this animal is frequently vouched for even in this enlightened age. We inoculated a pregnant goat with a saline suspension (containing 1 mg. to 5 c.c.) of the bacillus abortus (5683) isolated at the laboratory on December 20. Five cubic centimetres of this suspension was introduced through the jugular vein with a fine hypodermic needle. Although the injection was made very slowly, a little dysporea was noticed for a few minutes after the dose. This animal aborted a dead foetus on the thirteenth day following the injection. Aspirations from the foetal viscera on 1 per cent glycerin-agar gave an excellent growth on the fourth day.

STRAINS FROM DIFFERENT SOURCES.

We have a number of strains of the bacillus from different isolations made at the three farms. These include cultures made from milk, from the viscera and, in some cases, from the placenta.

Strain No. I.—From a dairy herd consisting of over forty cows; never had the disease before on the premises.

Strain No. II.—Obtained from a farm within 12 miles of Ottawa; first time in a great number of years that this disease has affected these cows.

Strain No III.—These include later isolations from a large herd on a new dairy farm. This dairy is purchasing cows from various parts of the provinces of Quebec and Ontario and cannot therefore offer information as to the origin of the disease.

Strain. I.

Cow No. 5484. Milk isolation, obtained December, 1913.
Cow No. 5487. Milk isolation, obtained December, 1913.
Cow No. 5486. Milk isolation, obtained January, 1914.
Cow No. 5496. Milk isolation, obtained January, 1914.
Cow No. 5683. Isolated from fœtus, December, 1913.
Cow No. 5690. Isolated from placenta, December, 1913.
Cow No. 5868. Isolated from fœtus, February, 1914.

Strain. II.

Cow No. 5689. Isolated from fœtal stomach, December, 1913.
Cow No. 6112. Isolated from fœtal stomach, March, 1914.
Cow No. 6113. Isolated from fœtal stomach, March, 1914.

Strain. III.

Cow No. 6006. Isolated from viscera of fœtal calf, February, 1914.
Cow No. 5946 represents culture No. 5683, after passage through goat.

ISOLATIONS FROM MILK.

The remarkable discovery of G. C. Schroeder and W. E. Cotton on the persistence of the abortion bacillus in the milk of cows, and particularly the demonstration of the fact that in one case it was eliminated from a cow's milk for four and a quarter years is a most interesting contribution to what was already known concerning the bacillus. As far as our preliminary investigations have gone in this direction we find that the bacillus is present in the milk of cows in the herds we are using for our work, and this milk injected into healthy guinea-pigs does produce pathological lesions and death.

We collected in November, last year, a number of samples of milk from cows which were known to have aborted. Utmost regard was given to aspsis in order to eliminate all possibilities of extraneous contamination. Sterile tubes were filled by squirting the milk therein from some distance. With this milk guinea-pigs were inoculated intraperitoneally with quantities from 5 to 15 cubic centimetres.

Before injecting, the milk was warmed to prevent shock. We find that guinea-pigs can accommodate large quantities of milk without any discomfort. Workers in this laboratory have used as high as thirty cubic centimetres without untoward results.

The first guinea-pig died on the thirty-sixth day following the infection, the second on the forty-fifth day, and several between this later period and the fifty-sixth day. Post-mortem examinations of these pigs revealed the characteristic enlargement of the spleen. The lymphatic glands presented signs of degeneration. The liver was enlarged, with whitish spots throughout its substance. In some of our guinea-pigs the characteristic changes in the organs were not so pronounced as recorded by Schroeder and Cotton, but this may have been due to the cold quarters reducing the vitality of the small animals so that they died before any great degenerative changes had taken place. Further, our organism may be of a greater virulence. In all our autopsies the clinical lesion in the spleen was taken as suggestive of infection and it was from this organ that our cultures of abortion were obtained. Spleen pulp spread over the surface of the solid tube media gave excellent growths in reduced oxygen. The bacillus obtained in these cultures possessed more rapid-growing qualities than those obtained from material in the original host (the placenta and uterine contents).

SERUM DIAGNOSIS.

One of the most important studies in connection with contagious abortion in cows is a reliable method of diagnosis. In September, 1909, Holth published his report on the agglutination and complement fixation for determining the presence of this disease. The fact that serum tests do not, so far at least, offer a means of distinguishing between cows which are actively infected and those which have possibly acquired an immunity, is a noteworthy fact. However, as Walls work on this subject demonstrates that agglutinins and immune bodies gradually disappear, in from six months to a year, it would be reasonable to suppose that a cow showing a high agglutination and fixation is to be looked upon with suspicion when it comes to a question of their introduction with a non-aborting herd. On an attached sheet are shown a number of serum tests secured with the blood of animals known to have been affected as the serum was secured from recently aborted cows. In the same group we obtained serums from cows and heifers which have not aborted but have been exposed to infection. In the second series the serum was from cows which were never known to abort. As controls, serum from horses and goats were used with negative results. Up to the present time the agglutination tests made have been conducted with about one hundred cows. For purposes of comparison the tables show the results secured from forty-six. The serums of cows from farms where abortion has not existed does not agglutinate in dilutions higher than 1:50. With one exception, all serums of aborting cows have given a positive agglutination in dilutions from 1:100 to 1:500, the exception being a cow which had aborted twice but fails to give an agglutination higher than 1:100. The ease by which an agglutination test can be made and its seeming reliability as confirmed by Bang, McFadyean, Stockman, Brull, Zwick, Holth, and Wall would seem to indicate that the method could be used with success. McFadyean and Stockman of the English Abortion Committee have thoroughly tested this method for its reliability. Of 535 steers, bulls, and calves, which prior were assumed to be not affected, there were only nine which gave an agglutination in a higher dilution than 1:50, four in a dilution of 1:100, and only one in a dilution of 1:200.

FIXATION OF COMPLEMENT (affected cow).

[1]Antigen.	[2]Cows serum.	[3]Complement.	[4]Saline.	[5]Hæmolysin.	[6]Cells.	Results.
2	.....	·5	·5	1·0	1·0	Complete.
1	0·2	1·0	·8	1·0	1·0	No hæmolysis.
1	0·15	1·0	·85	1·0	1·0	"
1	0·1	1·0	·9	1·0	1·0	"
	0·2	·5	2·3	1·0	1·0	Complete
	0·2	·5	3·3	.....	1·0	No hæmolysis.

1. Antigen extract 1 c.c. is dose or half the quantity which will not prevent haemolysis.
2. Inactivated cow serum 30 minutes at 55 C.
3. Complement of guinea-pig, quantity determined by previous titration.
4. Physiological salt solution, .85 per cent.
5. Double smallest quantity of sensitised rabbit serum, determined by titration.
6. 5 per cent saline solution of goat blood cells.

SESSIONAL PAPER No. 15b

Cows and Heifers from Aborting Herds.

Date.	Agglutination.					Comp. Fixation.	Remarks.
	1:20	1:50	1:100	1:200	1:500		
1 September, 1913	+	+	+	+	−		
2 " 1913	+	+	+	+	−		
3 " 1913	+	+	+	+	−	+ + +	Never aborted.
4 December, 1913	+	+	+	+	−	+ + +	
5 " 1913	−	−	−	−	−	.....	Heifer.
6 " 1913	+	+	+	+	−		
7 " 1913	+	+	+	+	+		
8 1912	+	+	+	+	−	+ + +	First calf.
9 January, 1914	+	+	+	+	−	+ + +	
10 " 1914	+	+	+	+	+	+ + +	
11 September, 1912	+	+	−	−	−		
12	−	−	−	−	−	.....	Heifer.
13 September, 1912	+	+	+	+	−	+ + +	
14	−	−	−	−	−	+	Heifer.
15	+	+	+	+	−	.....	Heifer.
16 January, 1914	+	+	+	+	+	+ + +	
17	+	+	+	+	+	+ + +	Heifer.
18 1912	+	+	+	+	−	+ +	
19 1912	+	+	+	+	+	+ + +	
20 1912	+	+	+	+	+	+ + +	
21 1912	−	−	−	−	−	−	
22 1912	−	−	−	−	−	+ + +	
23 January, 1914	+	+	+	+	+	+ + +	
24 " 1914	+	+	+	+	+	+ + +	
25 March, 1913	+	+	+	+	+	+ + +	
26	+	+	+	+	+	+ + +	Heifer.
27	−	−	−	−	−	− − −	Heifer.
28	−	−	−	−	−	− − −	Heifer.
29	+	+	+	−	−	+ +	Heifer.
30	+	−	−	−	−	−	Heifer.
31 January, 1914	+	+	+	+	+	+ + +	
32 September, 1913	+	+	+	−	−	+ + +	
33 June, 1913	+	+	+	+	+	+ + +	
34	+	−	−	−	−	+	Heifer.
35	+	−	−	−	−	− − −	Heifer.
36 September, 1913	+	+	−	−	−	+ + +	

Cows and Heifers from a Non-Aborting Herd.

Date.	Agglutination.					Complement Fixation.	Remarks.
	1:20	1:50	1:100	1:200	1:500		
1 December, 1914	−	−	−	−	−	−	
2 " 1914	−	−	−	−	−	−	
3 " 1914	−	−	−	−	−	−	Bull.
4 " 1914	−	−	−	−	−	−	
5 " 1914	−	−	−	−	−	−	
6 " 1914	−	−	−	−	−	−	
7 " 1914	−	−	−	−	−	−	
8 " 1914	+	+	+	−	−	−	
9 " 1914	−	−	−	−	−	−	
10 " 1914	−	−	−	−	−	−	

In addition, we have used the complement fixation test in some cases along with the agglutination using the washed red blood cells of the goat, amboceptor from the rabbit previously sensitized with washed blood cells of the goat, complement from the guinea-pig and antigen from broth cultures of the bacillus abortus.

Although our work with this method of diagnosis has been used only in a few cases compared to the agglutination test, the results have been quite satisfactory and with the exception of one case the combined tests gave the same results.

This year, if possible we are anticipating conducting experiments with a view to producing immunity. We realize that in order to obtain definite results it will be necessary to have a number of mature heifers and a bull and that these animals will come from herds known to be free from abortion.

It would seem reasonable to experiment with bacterial preparations in preference to expensive alien substances and now that we have a number of isolations of virulent and avirulent cultures we are in a position to determine the efficiency of vaccination.

To attempt work along these lines we should commence on a non-aborting herd owing to the fact that immunity may be acquired after an active infection when a number of abortions have occurred in the same animal. Before such experimental animals are purchased, their serums should be tested to ensure the work being commenced with non-infected animals.

REFERENCES.

Science, September 27, 1912.
F. M. Surface, Kentucky Experimental Station Report, No. 166.
E. S. Good, Kentucky Experimental Station Report, No. 165.
E. C. Schroeder and W. E. Cotton, Paper on Bacillus of Abortion in Milk.
Report of the British Commission, 1912.

APPENDIX No. 15.

STRANGLES VACCINE (EXPERIMENTAL).

(By T. C. Evans, V.S., Biological Laboratory.)

Since 1910 experiments have been conducted with suspensions of the *streptococcus equi* in the endeavour to produce an efficient vaccine for the prevention and treatment of strangles in the horse. So far the work has shown satisfactory results in such a degree that the Veterinary Director General instructed us to prepare a larger quantity last fall and authorized its free disbursement to practising veterinarians with a view to obtaining a general consensus of opinion as to its merits.

In studying the value of vaccine therapy applied to strangles the following facts regarding the alleged specific organism are available:—

(*a*) Strangles or *febra pyogenica* is a contagious febrile disease of the horse characterized by high fever, great depression, discharge from nasal chambers and very often glandular enlargement and breaking down particularly in the submaxillary lymphatic glands.

(*b*) That in all cases, whether from the benign flow of lymph from the nostrils, or from the broken-down cellular discharge from abscesses, the *streptococcus equi* is present in great numbers.

(*c*) That although there has been no evidence to show that the disease can be produced by inoculation of the *streptococcus* into a healthy horse we have been able to produce *pyemia metastasis* in smaller domestic animals and recover the germ again in pure culture.

(*d*) That it is possible to immunize healthy horses and smaller animals against analogous infections by subcutaneous injections under the skin of a killed culture prepared in the laboratory.

Exhaustive experiments have been conducted by Captain Todd of the British Army Veterinary Department, and many other European workers, in an effort to produce a characteristic attack by introducing material containing the microbe into the economy of healthy horses without very much success.

Some workers claim that there is a predisposing factor which acts in conjunction with the *streptococcus equi* in bringing about an attack. Baruchello found *streptococci* in fæces of horses which he considers harmless habitants of the intestinal canal but which may become harmful under certain conditions. Schutz considers his variety an independent species, while Foth believes it to be identical with Schutz *diplococcus* of influenza. Attempts to raise the virulence of a strain of *streptococcus* have been successfully carried out whereby it is more pathogenic to small animals and it is interesting to note that in so doing its morphological appearance changes to a remarkable degree. This may be termed a process of evolution because in initial stainings of the organism on slides from actual pus the *streptococci* are seen to be very small perfectly spherical bodies occurring in chain-like formation. These chains are very long and usually curved and twisted. Cultures obtained on various media from this source are invariably avirulent and non-pathogenic to mice. However, if the pus is obtained perfectly fresh and small quantities are inoculated into mice we can obtain a pure culture of an organism presenting microscopically more of an oval shape, and as successive inoculations from the same strain proceed we secure more of a perfect cylindrical disc. Quantities of pus from discharging abscesses and their metastases in horses have been inoculated into rats, guinea-pigs, and rabbits without producing death by

pyemia. If large quantities of pus are injected into the abdominal cavity of these animals one may produce death by septicemia and toxemia, although we have not been successful in isolating a pure culture from their blood afterwards. Very small quantities injected subcutaneously into the rump of white mice produce a pyemic infection, with involvment of the lumbra lymphatic glands and metasis. The rats, guinea pigs, and rabbits treated the same with a corresponding amount fail to die from this condition. The organism after passage through the mouse will destroy young guinea pigs even if administered in small amounts. An isolation of streptococcus direct from pus is not considered suitable for preparing an effective vaccine and we have therefore resorted to the above outlined method of raising its pathogenicity before attempting to make a potent preparation. In all experiments made for the purpose of testing the vaccine for its immunizing properties, we have used strains passed through one and two white mice determining its virulence by inoculating unprotected mice. A killed suspension containing the dead bodies of the cocci of this accentuated strain was found to protect white mice against subsequent infection when small quantities were injected under the skin.

Different strains of the streptococcus obtained from various sources were found to vary in pathogenicity. All the strains used for inoculation were first passed through the mouse. Only about 50 per cent were found to be pathogenic as the swabs were sometimes delayed in transmission and during this time subjected to a high temperature. These agencies may have killed the streptococcus although we found that it was impossible to infect some of the mice which had previously received inoculations of pus from these swabs. The disease in the mouse follows a definite course. Those dying of septicemia or toxemia were useless. The marked lesions are in the visceral lymph glands and from these we were able to obtain a pure culture in our various media.

At camp Petawawa where early work with the vaccine was conducted an excellent opportunity was afforded to test out its therapeutical value. Later it was used in connection with city practice in Montreal, Toronto and London.

On the 18th of May, 1913, eight hospital cases of strangles of the malignant type received a subcutaneous injection of "vaccine" consisting of two cubic centimetres of a three weeks' growth, killed suspension. A second injection was administered on the 21st, and on the 24th a material change was observed both in the appetite and temperature. Reports from a veterinary inspector at Toronto gave corresponding results. The veterinary officer of the 6th London Battery recorded a number of cases resulting from contact at Petawawa camp. These animals received "vaccine" treatment exclusively, temperature charts being furnished while the remainder of unaffected animals received immunizing doses. On the 9th June, 1913, the horses of one squadron of cavalry were given immunizing doses before entraining. On the 14th June the squadron entrained and spent five weeks at camp. During that period they remained free from strangles, and returned to barracks to be turned on to pasture for one month. The last report was to the effect that no strangles had occurred in these animals.

Last fall several thousand individual doses were prepared and labelled "Experimental Strangles" vaccine. This was supplied gratis to practising veterinarians by the Veterinary Director General on condition that they report upon its use, and results and opinion following same be forwarded to the department. The following letter accompanied each disbursement.

EXPERIMENTAL STRANGLES VACCINE.

"Experimental Strangles" vaccine has been prepared at the Biological Laboratory, by growing in a special serum media, a number of strains of *streptococcus equi* isolated from the pus of horses naturally infected with strangles. The cultures have been passed through experimental animals to accentuate their virulence. The vaccine is put up in three cubic centimetre ampoules preserved with the addition of glycerine and 0·2 per cent trikresol, and it is ready for immediate use.

This amount is judged by experiments to be the appropriate maximum dose for the average horse gauged so as to induce the maximum production of anti-bodies with the least physiological reaction.

Individual judgment, however, is necessary in certain cases. For instance where the vitality of the animal is low, as in malignant cases, it has been found that half the ampoule is a safe dose gradually increased in succeeding amounts until at the end of ten days, two ampoules may be safely administered in one dose.

When used to protect (prophylactic) one-half the ampoule may be given followed in two or three days by the full amount. In immunizing colts under one year of age take half the above dosage.

In using the vaccine in the treatment of active cases the best results have been obtained in giving it at the commencement of the illness. It has been safely given in full doses where the fever has been as high as 105° F., however, in cases showing prostration half the ampoule should constitute the first dose, followed in three days by the full amount.

ADMINISTERING THE VACCINE.

The glass ampoule is shaken to bring into suspension the dead bacteria in the precipitate. The ampoule should be shaken eighteen times. A hypodermic syringe with a glass barrel is most suitable and must be boiled before use. This is essential as the vaccine would easily become contaminated by using a dirty syringe. Rinsing the syringe in a strong disinfectant solution is fatal to the action of the vaccine and must be avoided.

After thorough shaking, break the neck of the ampoule at the file mark and draw off the contents through the needle of the syringe. Injection is made subcutaneously whether in the neck or in the loose skin of the breast at the sternum. The site for injection should be first painted with tincture of iodine.

Great care must be taken in the preservation of this product as our experiments have not indicated what deterioration may be anticipated and we would suggest that it be stored in a refrigerator or in a cool dark place where the temperature will not vary to any great extent.

The method of determining dosage was arrived at by giving varying amounts to a number of typical cases and noting results. For instance three horses affected with strangles in which there was marked depression received in each case six cubic centimetres at four days interval. In each instance the injection was followed by a profuse and stubborn diarrhœa. As the relations between the three were similar it was not considered an individual idiosyncrasy and the average dosage was then reduced to half the amount. Three cubic centimetres of this batch of vaccine did not produce serious depression when given subcutaneously, and this quantity was accepted as the maximum suitable amount. In associating the streptococcus with strangles we do so for reasons that have been set forth by all workers on this subject and even if the streptococcus does require some other factor for producing this disease we are quite certain by its evidence in all cases of strangles that it is the organism that occupies a most important part.

REFERENCES.

Captain A. G. Todd, A.V.C., Vet. Journal, 1910, p. 440.
Hutyra and Marek, vol. 1, p. 366.

APPENDIX No. 16.

RABIES.

AND THE SPECIFICITY OF NEGRI BODIES.

(*A. B. Wickware, V.S., Biological Laboratory.*)

It is only within comparatively recent years that rabies as a disease entity has occupied the minds of professional men, being regarded by many members of the old schools as a myth, and not as a concrete affection. The researches of Pasteur demonstrated its infectious nature and a means by which its fatal termination might be avoided. More recently, however, through the brilliant researches of Negri and other investigators, the disease now receives full recognition and as a result of the number of agonizing deaths attributable to rabies, both in human and lower animals, a profound study has been carried on relative to its etiology, prophylaxis and cure. The result of these researches has been the absolute control of the disease in England, while in many other countries, only sporadic outbreaks are now observed.

With the object in view of establishing to our own satisfaction the reliability of Negri bodies as a diagnostic finding and also the making of a general investigation of rabies from a laboratory standpoint, studies were commenced in the year 1908, and have been continued until the present, whenever material has been available for such purposes.

Observations have not alone been confined to diseased or infected animals but comprise also a large number of normal dogs obtained for the purpose of substantiating the evidence derived from our investigations as to the specificity or otherwise of the bodies described by Negri as being indicative of rabies in both human beings and the lower animals.

Much has been written of a controversial nature, both for and against the contention that these bodies are always present in positive cases of this disease, but very little evidence of a statistical nature is at present available in support of either view.

In 1908, during the outbreak of rabies in western Ontario, which assumed rather startling proportions and at which time numerous individuals were bitten, the writer unfortunately inoculated himself while conducting some experiments on rabbits, thus necessitating subsequent treatment at Toronto. This unforeseen circumstance resulted in much additional routine work being assigned to the other members of the staff, hence, owing to pressure of work and personal experiments which required their undivided attention, examinations for Negri bodies were not conducted at the laboratory, animal inoculations being given precedence. These latter involved less time and gave incontrovertible evidence as to the existence or non-existence of rabies in the suspected individual cases.

As a result of this mishap, much valuable data relative to the subject in hand were necessarily lost and, owing to the subsidence of the outbreak shortly afterwards, due to the rigid quarantine methods instituted by the department, an opportunity to carry the investigations further was rendered impossible except at rare intervals.

In 1903, Negri, an Italian investigator described certain cell inclusions appearing in the brains of animals dying of rabies. These inclusions were found principally in the ganglion cells of the hippocampus major and the Purkinge cells of the cerebellum. Much speculation has been made as to their exact nature, some maintaining that they are parasitic while others look upon them as cell degenerations. Notwithstanding

these diverse views, it has been demonstrated that they are present in nearly 98 per cent of the type known as street rabies and in these positive cases confirmatory results are always obtainable by animal reactions. The evidence adduced by our investigations is that the finding of Negri bodies is absolute proof of the existence of rabies, but the negative finding does not entirely exclude its presence. That such is the case is instanced by a specimen received recently from western Ontario in which an examination of the brain failed to reveal the presence of these bodies while slide preparations from inoculated rabbits dying twenty-three days thereafter, contained Negri bodies in countless numbers. Another abnormality, which it may not be irrelevant to mention at this time, is the change described by Van Gehuchten and others as present in the sympathetic and cerebro-spinal ganglia, especially the gesserian ganglia of affected animals. Normally the structure consists of a supporting network in which are found ganglion cells enclosed in a capsule lined with epithelium. In affected animals, on microscopic section, the nerve cells appear to be shrunken and surrounded by proliferated epithelial cells. However, a similar condition has been noted in the nerve centres of the dogs suffering from other affections so that now these lesions are not regarded as being pathognomonic of rabies.

In conducting our examinations for the detection of Negri bodies in both apparently normal and suspected individuals, control slides from positive sources are employed as considerable manipulation of the stains is required to obtain the best possible results, owing to a marked variability in the affinity possessed by certain nerve cells for a selected stain. In examining smear preparations it is advisable to make at least ten slides providing positive results are not obtained in a smaller number, as occasionally in a series often of twelve slides only one has given positive findings.

The Negri bodies appear included in the nerve cells and occasionally in the matrix. They are round, oval or elongated in shape and consist of a hyaline cytoplasm containing from one to six nuclei studded with chromatin granules. This nuclear proliferation apparently takes place without any corresponding cell division and thus differs from the mitotic changes observed in true cellular multiplication.

The argument advanced in support of the parasitic nature of the bodies is their appearance in nearly every case of natural infection while against this contention are urged the facts that they do not appear in animals killed with a fixed virus, their non-presence in infected virus and their capability of passing through the coarse Berkfeld filters. The parasitic exponents endeavour to refute these facts by saying that Negri bodies are simply the result of a cellular reaction to overcome an invasion by these ultimate forms.

Negri bodies vary in size from 1 μ to 25 μ and are usually better developed in cases showing a certain degree of latency or long period of incubation.

In preparing a fixed virus for prophylatic treatment, which is accomplished by serial inoculations from one rabbit to another, these bodies gradually diminish in size until they eventually disappear. When a stage is reached at which the virus obtained gives a typical reaction in rabbits in the same period of time which is usually about 7 or 8 days, the virus is said to be fixed.

In endeavouring to substantiate the specificity of Negri bodies for rabies, we have conducted inoculations from brain material in cases showing positive microscopic evidence as well as from those resulting negatively.

We have examined fifty normal dogs and never in one instance have we been able to demonstrate Negri bodies, while in nearly 97 per cent of cases in which these bodies have been found, the affection has been identified as rabbits by typical reactions in experimental animals.

Two species of animals were used for inoculation, viz., guinea-pigs and rabbits. The inoculation of the former was discontinued owing to the unreliable nature of the reaction which in our hands failed to reveal any pathognomonic symptoms enabling one to differentiate this disease from the various digestive disorders and obscure

maladies to which guinea-pigs are prone and which in many cases may result in death. In a great many instances these animals die without showing any prodromal symptoms to indicate the onset of any pernicious affection. However in animals that have indisputably succumbed to rabies, the microscopic examination of the brains has shown large well-marked Negri bodies, distinct in every detail, thus making an admirable animal for studying their structure.

The incessant chattering of male guinea-pigs described by various writers as being a constant feature in affected individuals, has been wholly lacking in those observed at this laboratory. Inoculations have also been made from an established infective virus in order to corroborate this assertion, but in almost every case, animals apparently well and normal in the evening would be found dead the following morning and when examined microscopically, invariably gave incontestible evidence of having been affected with rabies.

METHODS OF INOCULATION.

Inoculations are practised at the laboratory by the infra-orbital and sub-dural methods.

The procedure in the former consists in the introduction into the infra-orbital foramen by way of the orbital cavity of a small quantity of brain emulsion in a saline solution. The eye is first cocainized and when anaesthesia is complete, a long needle of slender calibre is introduced into the orbital cavity, commencing at the nasal canthus and passing backward behind the eyeball and thus through the above-mentioned foramen into the cranial cavity. This operation is attended with considerable difficulty, and proficiency can only be obtained after repeated injections have been made. Another objection we have to this method, is the inconstant results obtained as compared with the sub-dural injections.

The sub-dural method appears to be the ideal operation and consists in the removal of a small piece of the frontal bone by means of a trephine. This is performed under chloroform anæsthesia and is a painless procedure.

The period of incubation varies considerably in experimental animals, depending upon the virulence of the virus and the hyper-susceptibility of some animals as compared with others. The average period is from fifteen to twenty days, and death is nearly always preceded by characteristic symptoms. Numerous cases have been noted where out of three rabbits inoculated, two succumbed with typical symptoms of rabies within the above-mentioned period, while the remaining animal would either fail to react or else die at the end of three months. Aside from the clinical manifestations and the finding of Negri bodies in these latter reacting animals, subsequent inoculations have been conducted with a brain emulsion of the affected individual and in almost every case rabies has followed.

In those animals failing to react, we have another phenomenon, difficult of explanation. Rabbits surviving primary injections, fail to develop rabies after receiving subsequent large doses from a positive source and undoubtedly possess an active immunity against the disease.

The clinical symptoms in rabbits are characteristic and furnish a valuable means of ascertaining the presence of this dread disease. At the onset of the malady, the appetite while usually impaired in some cases becomes capricious in nature.

Eventually all food is refused, and the animal endeavours to seclude itself in a dark corner of the cage. This may be due to a desire to exclude strong light or an inherent wish to escape observation. Some individuals remain perfectly motionless, while others place their heads against a portion of the cage. This latter condition is undoubtedly the result of a cerebral disturbance, and persists until death relieves the sufferer. In the event of the animal being disturbed, spasmodic tremors seize the affected rabbit, these gradually subsiding until reproduced by some further annoyance. In some cases paralysis of the posterior portion of the body ere death takes place and, in nearly every instance, opisthotonus, affecting the head principally, is present.

The chief manifestation on which considerable reliance is placed is the spasmodic tremors occasioned when the animal is touched with the wire rod kept for that purpose. Affected rabbits leap high in the cage and seem to lose all power of co-ordination. This state is immediately followed by a condition of passiveness, occasionally accompanied by a harsh grating of the teeth.

In conclusion, I might make allusion to the fact that Nocard and Roux have demonstrated that the virus appears in the saliva about three days before the initial symptoms become noticeable and this knowledge aids materially in determining the danger of infection in individuals who have been bitten. Satisfactory results have also been obtained in animals by the prophylactic anti-rabic treatment. Dr. Nesbitt, of the American Biological Department, Kansas city, recently published a few statistics relative to the treatment of a number of animals which had been bitten by a dog affected with rabies. Of the animals injected, all recovered, while one cow, kept as control died showing typical symptoms.

While the foregoing relative to the treatment of animals exposed to rabies is interesting from the viewpoint of the experimentalist, we do not consider it good practice, as the methods employed in Canada to combat this affection among animals by the Health of Animals Branch are greatly to be preferred.

APPENDIX No. 17.

AVIAN TUBERCULOSIS.

(C. H. Higgins and A. B. Wickware, Biological Laboratory)

The disease known under the synonyms, consumption, tuberculosis, and the great white plague (the latter applying more specifically to the affection as found in human beings) is of such widespread importance as to warrant careful consideration, whether appearing in men or animals.

In preparing an article dealing exclusively with this malady as observed in fowls and birds in general, no presumption is made of bringing to light new disclosures, but rather an endeavour will be made to deal with the affection in a general way, from a pathological as well as economic standpoint, and also to record such of our experiments as have a practical bearing on the prevention and eradication of this disease.

It is only within comparatively recent times, slightly over a decade, that tuberculosis as a disease has been observed among fowls in Canada. The affection had probably existed for many years, but its true nature and significance was not recognized until diseases of poultry commenced to attract the attention of workers in comparative pathology. Even up to the present time, the importance of the conservation of domestic fowls is scarcely realized, and apart from the purely technical considerations of the diseases which they may contract, very little thought has been exercised as to how the fostering of the industry will affect our domestic economy.

The losses from tuberculosis have been large to poultry owners, but there is at present no means of arriving, even approximately, at an accurate estimate. Theoretically, poultry offer one of the best investments for capital, but the losses are so great that the theoretical estimate must be discarded. Once tuberculosis disease makes its appearance in a flock, the aggregate losses are large although a great number of birds do not usually die at one time. The general unthriftiness of the fowls, however, renders them unsuitable for table use; and the non-production of eggs makes the industry very unprofitable as well as discouraging to the poultry owner.

As avian or fowl tuberculosis, viewed from a causative standpoint, is almost identical with the disease as found in human beings and bovines, it is imperative that further research work be conducted in order to establish, if possible, its exact relation as a source of infection for other animals and man.

The matter is more pertinent since Mohler and Washburn, of the United States Bureau of Animal Industry, have reported the transmission of avian tuberculosis to mammals by the direct feeding of diseased organs, and also the infection of guinea-pigs by artificial inoculation with the whites of eggs from affected fowls.

That there is considerable variation in the morphology of the causative organisms found in the different forms of tuberculosis cannot be disputed, but extensive investigations have shown that even these apparently specific characteristics can be altered by artificial cultivation upon various laboratory media and also by growth in the tissues of different animals.

The fact that avian tuberculosis is transmissible to mammals, and the mammalian type communicable to human beings, serves to substantiate the theory that changes may occur in the human host whereby the avian and bovine types of organism may undergo transformation into the human type.

Recent statistics show that the bovine type of organism was present in 90 per cent of cases of cervical adenitis (enlarged glands of the neck) occurring in children in the

vicinity of Edinburgh, infection probably arising through the consumption of non-pasteurized milk. As these and many other cases of human tuberculosis have been traced to infection through the medium of raw milk it is only natural that one should question the possibility of transmission of this insidious disease through the medium of raw eggs. This assumption does not seem unreasonable in view of the fact that raw eggs form the principal article of diet for invalids and individuals whose natural resistance may be lowered and whose systems are impoverished from any one of a number of causes.

Himmelberger, of the Michigan Agricultural College, has recently succeeded in transmitting avian tuberculosis to a bovine, in which latter he obtained a reaction with avian tuberculin although unable to elicit a response when using the bovine tuberculin.

During investigations conducted at this laboratory throughout the past two years, our attention has been chiefly directed towards the microscopic detection of tubercle bacilli in eggs, the infection of experimental animals with these eggs, and the perfecting of a method of diagnosis whereby latent and incipient cases could be identified.

The possibility of congenital tuberculosis being present in chicks has been given considerable attention but our experiments in this connection have thus far given only negative results. Eggs from tuberculous fowls have been artificially incubated and the chicks immediately transferred to new quarters where special precautions were taken to prevent infection from outside sources. The most careful autopsies, however, failed to reveal lesions of tuberculosis, while cultures from splenic tissues gave negative results.

The demonstration of acid-fast[1] organisms in eggs was also undertaken and in nearly 20 per cent of the latter, bacilli microscopically indistinguishable from tubercle were found to be present. The subsequent inoculation of guinea-pigs with material from these eggs produced a generalized tuberculous infection, from which typical avian cultures were procured.

PREVALENCE.

The prevalence of avian tuberculosis throughout Canada is, every year, becoming more apparent. This is evidenced by the fact that inquiries from widely separated sources are, from time to time, received at the laboratory, concerning this affection. These inquiries usually come from individuals extensively engaged in poultry production, while a few are received from farmers. There appears, however, to be a striking apathy on the part of the latter in regard to the diseases of, and the care in general of poultry, due in no small measure to the false impression that fowls are of small economic importance as compared with other species of the live stock. In the fall of 1913, while on an official inspection trip, one of us had the opportunity of visiting a locality where large numbers of poultry were being lost. On making inquiries, the information was that the farmers in the vicinity had been losing immense numbers of fowls, for which no cause could be assigned. Autopsies on several hens revealed the affection to be tuberculosis and, on one farm, a clinical observation showed several to be suffering from lameness which was apparently tubercular in nature.

SYMPTOMS OF THE DISEASE.

The causative organism or germ of tuberculosis gains entrance to the system, usually with the food, and finding a favourable location grows and extends to the various tissues. This growth of the germ induces symptoms of unthriftiness, and this unthriftiness is followed sooner or later by death. The detection of tuberculosis from the symptoms is not always easy. Some may be observed to be "going light," yet they are seen to be good feeders. If picked up it is found that the flesh has almost entirely

[1] Tubercle bacilli from any source possess the peculiarity of retaining the dye material used for their study in the presence of acid, hence the term acid-fast.

disappeared from the breast bone, and this should make one suspicious that something is wrong. A yellow or greenish diarrhœa is frequently present in affected birds and, where this is present the type of the disease is most dangerous to the remainder of the flock, as the germs are to be found in the droppings in immense numbers. .

One of the most frequent symptoms seen early in the course of the disease is lameness, a result of the infection involving a joint of the leg. Lameness is mentioned by persons forwarding fowls for diagnosis more frequently than any other symptom where our subsequent examinations have proven the trouble to be due to tuberculosis. So frequently is lameness the principal symptom observed that we are at once suspicious of tuberculosis whenever the symptom is mentioned.

COURSE OF THE DISEASE.

Fowl affected with tuberculosis may die in a few days from the first appearance of symptoms, or they may linger for weeks, gradually becoming more emaciated as the disease progresses, until they die from exhaustion. The progress is largely dependent on the strength of the invading germ and the natural resistance of the bird. Some outbreaks of the disease follow a more rapid course than others; usually, however, the course in an individual extends over weeks, and sometimes months may intervene before death takes place.

POST-MORTEM FINDINGS.

The post-mortem findings in fowl tuberculosis, when considered in relation to the symptoms and general history, are characteristic. The liver is usually the principal organ affected, and there are lesions from the size of a pin point to that of a large pea, which are white or yellow in colour. The larger lesions when cut into give a gritty sensation as the knife passes through them. These lesions are distinct from the liver tissues and may be quite easily separated from the liver itself. In the more acute cases the liver may be greatly enlarged, even to twice its normal size. This enlargement in chronic cases is noticeable. The spleen is usually involved, the lesions having the same characters as mentioned for those in the liver. The enlargement of the spleen is usual, and it may be four times its normal size. The intestines may or may not be involved. When lesions are present we find nodules from the size of a small pea to that of a medium-sized nut. The minute dissection of these usually presents a free opening into the inside of the bowel, and at this point of entrance there is an ulceration. It is through this opening from the nodule on the intestine to the interior of the bowel that the bacilli gain access to and are so easily distributed by the droppings.

Other visceral organs are seldom involved. It is frequently observed that the joints, notably that of either or both hips may be the seat of tubercular ulcerations. Such an ulceration is the cause of lameness during life.

EXPERIMENTS AT THE BIOLOGICAL LABORATORY WITH THIS DISEASE.

We have conducted experiments with a view of determining the possibility of transmitting tuberculosis through the eggs laid by tuberculous fowls. For these transmission experiments we secured a flock of tuberculous fowls, quartered them in special quarters, hatching the eggs in an incubator.

When sufficient eggs had accumulated to fill the small incubator secured for the purpose (one of sixty-egg capacity) the fowls from which they had been obtained were autopsied. Prior to autopsy, however, they were tested with tuberculin prepared from

an organism of the avain type, with negative results. Negative results also followed the use of a special tuberculin intra-ocularly (dropped in the eye) and intra-dermally (injected into the skin).

Ten of the fowls above referred to were affected with tuberculosis in various stages, while one failed to show lesions. The principal organs affected were the livers and spleens, the other organs did not show lesions, save in one instance. In this hen a chronic tubercular peritonitis had developed, with adhesions. Small pedunculated tuberculous nodules adhered to the outer coat of the intestines. Ascitic fluid was present, and emaciation marked.

The transmission experiments were not of as conclusive a nature as we desired, owing principally to the fact that the incubator which we were using did not give satisfactory results. Nine chicks only were secured from sixty eggs, of which over 80 per cent proved to be fertile. This machine later failed to give satisfactory results with eggs from another source.

Some of the chicks were autopsied at intervals, the last being destroyed when eight months old. In none of these chicks were we able to detect lesions of tuberculosis.

These negative findings, however, do not prove that tuberculosis may not be transmitted in this manner, for, at the autopsy of the fowls providing us with the eggs used in this connection, lesions were present in over 90 per cent, and in no instance were they of special character. At the autopsies we did not find evidence of tuberculosis involving the ovaries or the oviduct.

With these organs involved the probability of the chicks becoming affected would naturally be greater than was the case with the birds above referred to.

DETAILS OF EXPERIMENTS WITH TUBERCULIN.

In an endeavour to test the merits of tuberculin as a practical diagnostic, experiments have been conducted on twelve tuberculous fowls, four birds being used for each test.

A specially preparded avian tuberculin was used for subcutaneous, intradermal and ophthalmic tests.

Experiment No. 1.—Four fowls were used for the subcutaneous test, temperatures being taken every two hours until six had been recorded. At the expiration of this period each hen was injected with two cubic centimetres of avian tuberculin. The recording of temperature was again continued after an interval of eight hours and taken every two hours until twelve readings had been made.

Result.—In none of the four cases under observation was any marked variation of temperature noted.

Experiment No. 2.—Four fowls were each given 1 c.c. of concentrated tuberculin intradermally, the thickened skin of the breast being chosen.

Result.—No evidence of any local or thermic reaction observed.

Experiment No. 3.—Four fowls were used each receiving one drop of concentrated tuberculin in the eye.

Result.—No evidence of an ophthalmic or thermic reaction noted.

It was then decided to conduct a test with a view of ascertaining the possibility of a thermal reaction occurring during the first or second hour following the injection. Similar parallels had been noted by many observers while applying the tuberculin test in cattle and in view of the circumstances tests were conducted after this manner.

The results are tabulated below:—

		Hens.		
Date.	Time.	No. 1.	No. 2.	No. 3.
June 22, 1912	1 p.m.	106·2	106·2	108
	2 "	106·4	106	106·4
	3 "	106	106·2	106
	4 "	106	106·4	106·4
	5 "	105·6	106	106·4
	6 "	105·8	106	105·8
	7 "	105	105·4	105·6
	8 "	105·8	104·6	105·4
	9 "	105	104·8	105
June 23, 1912	5 a.m.	106	106	106
	6 "	105·6	106·4	106
	7 "	105·6	106	106
	8 "	105·6	106	106·2
	9 "	105·8	106·2	106
	9 a.m. Injection.			
	9.30 a.m.	106	106·2	105·6
	10.00 "	106	106	105·8
	10.30 "	106	106·2	106
	11.00 "	105·8	106	106·2
	11.30 "	106	106	106·2
	12.00 "	105·4	106·2	106
	12.30 p.m.	105·4	106·4	106·4
	1.00 "	106·2	106·8	106·4
	1.30 "	106·4	106·6	107
	2.00 "	106·2	106·8	106·8
	2.30 "	106·6	107·2	106·8
	3.00 "	107	106·8	107
	3.30 "	107·4	106·6	106·8
	4.00 "	106·4	106·4	107
	4.30 "	106	106·2	106·4
	5.00 "	106·6	106·4	106·4

SPECIES OF BIRDS AFFECTED WITH TUBERCULOSIS.

The affection has also been observed in canaries, lesions having been demonstrated in two birds autopsied by one of us at the Pathological Laboratory of Queens University, during the past winter. These birds were obtained as domestic pets from a dealer in Toronto, and shortly after being received showed clinical manifestations of a respiratory affection, death taking place in the course of a few weeks. Gross lesions were present in nearly every organ, and microscopic examination showed myriads of acid-fast bacilli of the avian type.

We have observed the disease in turkeys in a number of instances. In one instance, when a turkey was affected the history seemed to indicate the possibility of its having been transmitted from a bovine source. We were unable, however, to follow this up and absolutely determine this possibility.

TRANSMISSION OF TUBERCULOSIS FROM BIRDS TO MAN.

As a recorded instance of the danger of transmission of tuberculosis by birds to the human being, the following extract from a lecture by Dr. H. Roger[1], professor of comparative pathology of the Faculty of Medicine, Paris, is very significant:

"Animals that live in close promiscuity with man frequently contract tuberculosis, and may transmit it. By opposition to the belief of times gone by, the dog is often

[1]Am. Vet. Rev., vol. 41, p. 2, European Chronicles.

suffering with it. It may localize itself in the kidney, giving rise to lesions of softening, and throwing in the urine considerable quantities of bacilli. Again, see the danger of the propagation, which is so much greater that canine tuberculosis is easily overlooked. It is often manifested by productions of neoplastic appearance which resemble more those of cancer than of tuberculosis.

"These home pet animals are yet more dangerous. Those among you who have been in my laboratory have seen a parrot, now dead, which had cutaneous tuberculosis. As is commonly the case, this bird had been infected by her owner who had advanced tuberculosis, and the bacilli of human origin had invaded the skin of the head of the bird and promoted the growth of the warty lesions. In cases of this kind the animal, annoyed by these growths, scratches itself as it can; scabs of the skin get loose. These are particularly rich in virulent bacilli. Their dissemination spread the disease, and the infection is so much more dangerous when passing from the parrot; the pathogenous agent seems to have gained more infectious power. What is the end of the history of this bird? The first owner died. By his will the parrot went to a young woman, healthy and strong. After a few months she began to cough, to lose flesh. Affected with acute tuberculosis she died in less than a year. No one around her had suspected the cause or origin of her disease. Her physician had never suspected it. Having become too homely, no one wanted the bird any more, and he was sent to my laboratory, where, for those who have seen his lesions, a diagnosis will remain evident and easily confirmed by bacteriological examination."

PREVENTION AND TREATMENT.

In the prevention of tuberculosis and other infectious diseases of fowl, sanitary surroundings, with plenty of sunlight and fresh air are requisites of prime importance. In our opinion, these features are best obtained by the use of the modern cotton-front house, a number of types having been described by various poultry authorities. Circular No. 7, prepared by the late Prof. A. G. Gilbert, of the Experimental Farm staff, describes in detail the method of construction and may be obtained on application.

The best means of preventing and treating tuberculosis in fowls is to destroy the entire flock if all have been running together, and to thoroughly cleanse and disinfect the quarters which they have occupied with any good disinfectant, one of which is a 5 per cent solution of crude carbolic acid. This may be made by adding two teacupsful of crude carbolic acid to a pail of hot lime wash. This should be applied with a spray pump, brush, or old broom to all parts of the house occupied by the fowl. This method of disinfection is suggested, owing to the fact that in tuberculosis or consumption in fowls, as has already been indicated, the bacilli or germs are found in the droppings in great numbers, and these should be destroyed. This action is further recommended as it has been shown that fowls, dead of tuberculosis, if eaten by hogs communicate the disease to them, and it is probable that the droppings would also communicate the disease in a similar manner.

When destroying the birds after it has been demonstrated that tuberculosis is present, some may be suitable for food if an examination of the livers shows no yellow or white spots from the size of a pin point to that of a pea, and there are no nodules or lumps on the intestines. When these lesions are present the flesh cannot be considered suitable for human food.

We have found that eggs from tuberculous fowls may contain the bacilli or germs in the white, and we, as well as others, have demonstrated that they are in sufficient numbers to infect small experimental animals.

This suggests a possible source through which tuberculosis may be introduced into a flock, namely, by the unsuspecting purchase of eggs from someone who has tuberculosis among his fowl.

The drastic measures above recommended should be followed in all cases when tuberculosis appears among fowl. These measures, while temporarily entailing a considerable loss, will in the end prove the most economical to the owner and the community.

INSTRUCTIONS FOR SENDING MATERIAL FOR EXAMINATION.

Where it is desired to determine the nature of any condition causing losses among fowl, an examination will be undertaken by the Biological Laboratory, Ottawa, providing suitable material is supplied. If possible, two live but affected birds should be forwarded by express in order that a thorough autopsy may be made. It is not necessary to prepay the express. When the condition has been found at autopsy, the diseased tissues may be sent by mail, if properly packed and preserved. Tissues may be preserved in pure alcohol or a solution of one part of formaldehyde to nine parts of water. After an examination has been made, suggestions will be forwarded for the prevention of further losses.

Specimens sent by express or mail should be addressed to the

Biological Laboratory,

Ottawa, Canada.

Information concerning the losses which have been experienced should be sent with the material in order that it may be properly identified. The name and address of the sender should be written plainly so that the result of the examination may be forwarded with the least possible delay.

SESSIONAL PAPER No. 15b

APPENDIX No. 18.

ENTERO-HEPATITIS OR BLACK-HEAD IN TURKEYS.

NOTES AND EXPERIMENTS.

(By Chas. H. Higgins, A. B. Wickware and N. M. Guiou, Biological Laboratory.)

There have been undertaken at this laboratory for the past few seasons, a number of experiments having as their object, the rearing to maturity of turkeys from a flock of infected birds.

The researches into the nature of this malady have been connected with the etiology, diagnosis, treatment and prophylaxis. It is to be borne in mind that what we may offer is intended as a synopsis of our work and observations and not as a full treatise on the disease. As our experiments have been conducted on a small scale, too much dependence cannot be placed upon the interpretation of the reactions or the results obtained.

ETIOLOGY.

At the outset we may state that we accept, in the absence of incontrovertible data, the amœbic theory o fthe disease, originally reported by Theobold Smith in 1894-5.[1]

His findings have supplied us with much valuable data and have proven of great assistance in the conduct of the work. We do not care to enter into a discussion of the theories other than that it is of amœbic origin, as our results in this connection can only be reported when we have completed certain experiments in transmission. These experiments in transmission cannot be undertaken until we have found some means of positively predetermining that the stock on which we are experimenting is free from active or latent infection. At present there is to our knowledge no known means of making such a determination and, therefore, we believe that assertions from any investigator should be withheld until accurate scientific data are available.

We present herewith a résumé of our experiments during the past summer, as we believe that other investigators should have the advantage of the experience gained. At the outset we may point out that we have not lost sight of the possibility of some other factor or factors being connected with the occurrence of this disease.

We are aware that similar lesions to those of entero-hepatitis in turkeys may be found in the livers of fowls whose history is unknown. We have had lesions of entero-hepatitis in the livers of young chicks exposed to infected turkeys. We also know that turkeys showing no outward manifestations of the disease at the time, although severely affected the previous season may possess characteristic lesions in the cæca. From this data it is quite possible that the problem of dealing with entero-hepatitis, having in view the desirability of its complete eradication or prevention, will prove more difficult than has heretofore been considered probable.

We have conducted numerous experiments with amœbæ from the more common sources with a view of familiarizing ourselves with the methods of cultivation. It having been reported by various observers that amœbæ normally exist in the intestines of many animals, plate cultures were made from a variety of sources. Plates were inoculated from the intestines of nine guinea-pigs, and two of these yielded growths of amœbæ. The site from which we took the material was, in most cases, the cæcum. Cultures taken from two frogs which it was expected would be more likely to harbour

[1] U. S. Department of Agriculture.

amœba than any of the other animals, resulted negatively. A few amœbæ were obtained on a plate culture made from the intestine of a toad, while the intestine of an English sparrow yielded amœbæ in abundance. The usual method of inoculating the plates was to smear some of the intestinal contents directly on the surface of the medium. In the case of the sparrow and toad, however, the intestine was removed from the abdomen, slit open along its entire length and left in a Petri dish of dilute alkaline broth for a few days. At the end of that time some of the scum which had collected on the surface of the broth was transferred to the surface of a solid medium. This method was found to yield satisfactory results. In the case of the turkey, amœbæ have been obtained in abundance on a plate culture made from a liver presenting the characteristic lesions of entero-hepatitis, but we have not secured this positive result in every case, and further observations are necessary before we can be sure that the lesions of entero-hepatitis constantly yield a growth of amœbæ. A plate culture from the diseased cæcum of a turkey affected with entero-hepatitis showed the presence of amœbæ after three months.

On several of the amœbæ plate cultures of animal origin, the presence of actively motile paramecia was noted, and, in the case of the culture from the cæcum of the turkey affected with entero-hepatitis several other varieties of actively motile protozoa were present.

In addition to these studies of organisms thought to bear some causal relationship to this disease, inoculation experiments with pathological material obtained at autopsy have been carried out to a limited extent on some of the laboratory animals with a hope that some light would be thrown on the etiology of this affection. The experiments performed are listed below, but as many of these have not been repeated, we cannot attempt to draw any general conclusions therefrom. A great advance would be made in the study of the disease could it be communicated to some of the more easily handled laboratory animals.

Experiment 1.—An aqueous emulsion of the black-head liver was prepared.

(*a*) Some of this was injected per ano into white leghorn hen. Result, died in 36 hours. Post mortem examination, intestine inflamed. (Worms were noted in the cæca, but these have no significant connection with the experiments in question.)

(*b*) Injected some per ano into hen 24 by means of a soft rubber catheter on end of syringe, no untoward result.

(*c*) Injected some per ano hen 19, no result.

(*d*) Injected some into two guinea-pigs, one intra-peritoneal, other subcutaneous, no result. (Used these animals later, see 'Saline Antigen.')

(*e*) It being known that amœbæ from liver abscesses in man set up a fatal dysentery when injected into the rectum of a cat, some of this refrigerated emulsion was injected per ano into a cat, no result.

Experiment 2.—Made an emulsion of fresh diseased cæcum in warm saline.

(*a*) Injected some into rectum of cat. Died in seven days, intestine acutely inflamed, with petechial hemorrhages throughout, cæcum greatly involved, and the lumen filled with blood in some places.

(*b*) Injected some per ano into hen 19, no result.

(*c*) Injected some into rectum of white mouse, no result.

Experiment 3.—Prepared an emulsion of black-head liver and injected per ano into hen 24, no result.

Together with these animal experiments might be mentioned the following:—

Some blood was drawn from turkey 443, suffering from black-head, and injected intravenously into turkey 317, apparently healthy; no result.

DIAGNOSIS.

The diagnosis of entero-hepatitis in acute cases presents no difficulty. This loss of muscular tone producing moping with drooped wings and head, the cyanotic appearance and sometimes atrophy of the normally red appendages about the head, and the passing of liquid, yellow, malodorous droppings, produces a clinical picture that cannot be mistaken. In addition to the above mentioned well-marked symptoms, we have noticed in some of the birds a red ring around the anal orifice at the muco-cutaneous junction, and in these birds a distinctly pinkish colouration of the scaly portions of the legs is quite obvious. In young poults the liver lesions may sometimes be seen through the thin abdominal wall. On post-mortem examination, the liver spotted with yellow areas about the size of a 10 cent piece and the greatly enlarged cæca are quite characteristic. The ureters have been observed to be full of yellow pigment, so the origin of the yellow pigment in the droppings is at least partly accounted for. It is reasonable to suppose that the yellow pigment produced in the liver lesions is carried by the blood stream to the kidneys and there eliminated.

The following table appears to indicate that a sub-normal temperature is a feature of the disease:—

Turkey.	Temperature.
293*†	106
443*	106·2
401*	107
317	107·1
461	107·2
347	107·2
251	107·3
402	107·3
31	107·4
449	108·1

*Clinical case of blackhead. †Died of the disease on the following day.

THE SERUM DIAGNOSIS OF ENTERO-HEPATITIS.

Considerable work has been conducted in an endeavour to obtain a method for the serum diagnosis of this disease with the hope that it might be of service in determining the existence of an infection in chronic carriers. We are unable to say at present whether the disease will admit of diagnosis in this manner but a brief summary of what has been done is here given.

Our effort to secure healthy birds a year ago from an outside source may be considered as wholly unsuccessful, for a number were ill on arrival, and subsequently died of the disease. This impressed us with the desirability of securing some means of determining whether or not a given bird was free from infection. We were in possession of such data as the staff of the laboratory had previously secured, and decided that the most promising results would follow experiments in some method of serum diagnosis.

Agglutination tests being out of the question when we are unable to propagate the causative factor of the disease in pure culture, our efforts have been directed chiefly along the line of complement fixation. It is not our purpose in this outline of the season's work to enter into the full details used with the complement fixation test. If the final result of this investigation is favourable, full details will be given in a later report.

The first difficulty that presented itself in endeavouring to diagnose the disease by this method was the absence of the causative micro-organism from which to prepare our antigen. Accordingly we have endeavoured to obtain an active antigen, using therefor a modification of Wassermann's original reaction for the diagnosis of syphilis, in which the antigen is prepared from a liver rich in spirochaetes.

We find that the best method of obtaining the sample of blood from the turkey is to make a small incision with the point of a sharp scalpel over one of the large veins on the under surface of the wing, the incision running lengthwise of the vein and extending through the skin, superficial fascia, and the wall of the vein. The blood is collected in a flat-bottomed vial. In this way 25 c.c. of blood can be readily obtained from an adult bird. The ordinary method of taking the sample in one of Wright's blood capsules has been found to be unsuitable in the case of the turkey, for owing to the high temperature of the bird, the blood clots almost as soon as drawn and plugs up the small arm of the tube. The serum is drained off the clot and inactivated by heating from 55° to 58° C. for thirty minutes.

The principle of the test depends on the employment of two complement-amboceptor-antigen groups with the same complement common to both. In the first group the amboceptor is the supposed specific antibody in the blood of the affected turkeys, the antigen is supposed to be contained in the saline extract of black-head liver. In the second group the amboceptor is the hæmolysin specific for the goat's erythrocytes (red blood cells) derived from a rabbit injected with these corpuscles. The complement common to both is derived from guinea-pig serum. The union or non-union of the substances in the first group produces no visible change. In the second group, however, the union of these substances produces the phenomenon of hæmolysis (the dissolving of the red blood cells), the presence or absence of which is easily seen. If we now add turkey serum to the antigen of entero-hepatitis in the presence of free complement, and if the serum contains specific amboceptors, the complement, amboceptor, and antigen will unite and the complement will disappear from the solution. If no hæmolytic amboceptor and corpuscles are added no hæmolysis will take place as the complement has been fixed. If, however, the turkey serum does not contain specific amboceptors the complement will not have been fixed and hæmolysis will take place.

Two kinds of antigen were prepared, alcoholic and saline. The alcoholic antigen, prepared from black-head liver in the same way as "syphilitic" antigen is prepared from guinea-pig liver at first gave satisfactory results but subsequently developed hæmolytic properties and had to be discarded. A saline extract of black-head liver was prepared by shaking up the diseased tissue with glass beads for about three days in the shaking machine. It was proved to be non-hæmolytic and 1 c.c. of a 10 per cent solution was found to fix 3 M.H.D. of complement. The guinea-pigs which had already been injected with black-head liver emulsion were given several injections of this saline extract at four-day intervals. At the end of the time the serum of one of these guinea-pigs, when examined for antibodies, gave complement fixation with the saline entero-hepatitis antigen and alcoholic entero-hepatitis antigen but not with alcoholic antigen prepared from guinea-pig liver. Had this experiment resulted negatively it would have shown us that there were no antibodies for our supposed antigen and attempts to get a serum diagnosis would have been useless. The positive result while not by any means proving that there are specific antibodies for our antigen at least allows a possibility for their existence.

An attempt was then made to apply the complement fixation test to several of the laboratory turkeys, some of which were supposed to be chronic carriers of entero-hepatitis infection. The quantity of serum which contains enough amboceptor to combine with the minimum hæmolytic dose of complement varies in different diseases. In syphilis 0·05 c.c. is sufficient, while in glanders 0·1 to 0·2 c.c. are required. It was thought that as the birds at that time did not have the disease in an acute form a large amount

of serum would have to be used in order to get enough antibodies. Accordingly 1 c.c.[1] was used. The result was that practically every tube showed complement fixation. On consulting the control tubes it was found that the turkey serum alone was fixing the complement. This rendered the estimation of the complement-fixing power of turkey serum necessary. This was accomplished with a mixture of the sera from different turkeys and it was found that 1 c.c. of turkey serum fixed 6 doses of complement.

The next time the test was applied, serum was obtained from a turkey affected with entero-hepatitis, and serum from a young healthy poult was used as a control. The necessary allowance was made for the complement fixing power of the turkey serum and antigen and the result of the test was complete hæmolysis in the case of the young turkey serum with a slight evidence of complement fixation in the tube containing the entero-hepatitis turkey serum. The control tubes showed that the hæmolytic system was working and that none of the substances used fixed all the complement themselves.

It was then thought that the requirements necessary to make the test practical were to ascertain by repeated trials the right strength of antigen and the right quantity of entero-hepatitis turkey serum that would cause a complete suspension of hæmolysis in a positive case. The test has since been conducted with various quantities of antigen and turkey serum, but it has been found that while there is undoubted evidence of complement fixation that the serum control tubes also show a certain amount. This would indicate that the complement fixing power of turkey serum is very considerable, and a large amount of work will yet have to be undertaken to determine whether this is a variable factor in the test before we can say that the disease admits readily of a diagnosis by the method of complement fixation.

Precipitins.—It has been found that entero-hepatitis turkey serum gives a precipitate when added to extracts of diseased liver, but enough work has not been conducted in this connection to enable us to express an opinion as to the specificity of this reaction.

PROPHYLAXIS.

In endeavouring to discover methods which will prevent the spread of this disease, we must first find some measure which will as efficaciously as possible stop the transmission of the disease from parent to offspring, or, from the chronic carrier to the healthy bird. Furthermore, this method must at the same time be of such a nature as to admit of the practical employment by the average farmer.

The ideal to be attained is to have a flock free from disease, start this flock in clean sanitary surroundings, and breed from them without the introduction of new birds which may be chronic carriers of the disease. In our judgment it would be better to raise a flock from the eggs by artificial incubation and brooding.

An attempt has been made to raise a healthy flock from birds that are known to be infected by incubating the eggs and keeping the poults on ground where turkeys had not previously been quartered, and never letting them come in contact with the adult birds. As a control, a small flock of naturally hatched poults were allowed to run with an adult hen turkey which had been a member of the infected flock.

This experiment was unfortunately interfered with by the crows destroying a large number of the incubated poults, but the experiment was still continued. It may be said that no dependence could be placed in the experiment should the isolated turkeys not develop black-head as some farmers' flocks are healthy anyway, but it must be borne in mind that the disease exists in a virulent form in the flock of adult birds at the laboratory so that there is every opportunity for the disease to be transmitted from parent to offspring.

The result of the experiment has been that four poults allowed to run with the adult bird have developed the disease and three deaths have occurred, while as yet

[1] As a matter of fact this part of the test was performed in small tubes, a definite quantity in a nippled capillary pipette being taken as equivalent to 1 c.c.

no evidence has appeared of its existence in the isolated birds. It must be admitted that the experiment has been necessarily conducted on an exceedingly small scale and that it will have to be repeated several times before we can attempt to draw any conclusions. The fact that at the present time among the adult birds and the poults that have come in contact with them there have been several clinical cases of black-head, and deaths have occurred, while the isolated, artificially incubated birds are free from the disease, gives promise of further investigations into this system of prophylaxis resulting favourably.

TREATMENT.

In searching for a remedial agent for this disease we have endeavoured to investigate some of the substances used in the treatment of protozoan affections. It was first necessary to determine the dose for the turkey and then as cases occurred the effects of these agents were noted.

There is to our knowledge no known specific for controlling the ravages of this affection.

Muriatic acid.—The use of the muriatic acid in the drinking water was found some seven years ago to be followed by beneficial results on affected turkeys which one of us (Higgins) endeavoured to raise. Later it was given a further trial, and three years ago a single turkey at this laboratory made an apparent recovery. During the past four years we have recommended it as being the best medicinal agent which we know to assist in overcoming the affection. A large number of the affected birds have recovered after receiving liberal allowances of this acid.

Some apparently remarkable recoveries have followed the use of this acid, but one cannot hope to bring all affected birds through an attack.

The acid used is a teaspoonful of muriatic acid (Acid Mur. Dil. B.P.) in a quart of drinking water. This acidulated water should be placed in a porcelain or glass vessel and is suggested in the hope that the birds may be carried over an acute attack. At the outset, when the birds show evidence of being severely affected, it may be of advantage to triple the amount of acid (using three teaspoonfuls to the quart of water) for the first three days. This amount will not injure the turkeys and may assist them in more rapidly overcoming the infection.

They should be confined during this period on dry, sanded board floors, in well lighted and well ventilated quarters and allowed access to no other liquid. If allowed to roam they may obtain sufficient water for their requirements from the dew-laden grass or other sources, and, therefore, will not drink the acidulated water. If confined, green food should be supplied in addition to the grain ration.

EMETINE HYDROCHLORIDE.

Acting on the amœbic theory of the disease our attention has been drawn to emetine hydrochloride, which of late has attracted much attention in medical circles. Ipecac has been used for some time in amœbic dysentery, but very recently soluble salts of emetine, its active principle, have been hailed as a specific for this affection, no less efficacious than quinine in malaria and neosalvarsan in spirochaetal infections.

The following experiments were conducted to determine the dose for a turkey:—

Turkey hen 447.—

August 19.—½-grain keratine coated pill emetine hydrochloride.
" 25.—2 ½-grain keratine coated pills emetine hydrochloride.
" 26.—2 ½-grain keratine coated pills emetine hydrochloride.
" 27.—2 ½-grain keratine coated pills emetine hydrochloride.
" 28.—Dead, post-mortem, nothing abnormal.

Gobbler 445.—

½-grain pill for four days, then found dead. Post-mortem, lesions of black-head.

Turkey hen 317.—

¼ grain for five days, still alive, no serious effects.

Turkey hen 347.—

½ grain every other day for four doses, still alive, no serious effects.

These experiments show that one-quarter grain a day or one-half grain every other day are safe doses.

Turkeys suffering from the disease were given one-quarter grain pill a day for about a week and showed no improvement. Later the hypodermic injections of this same drug were tried. At first one-sixth grain was given, then one-third grain. After a few injections the birds began to show improvement and the diarrhœa became a less noticeable symptom. They recovered while another turkey which did not receive emetine hypodermically died of the disease. Two poults showing marked clinical evidence of the disease were treated but both died. The lesions in each were found to be very extensive at the autopsy.

Further observations will be necessary before we can draw any conclusion as to the remedial action of emetine hydrochloride in this affection.

ATOXYL.

The use of this arsenical preparation in trypanosomiasis has suggested its use in this supposedly protozoan affection. Up to the present time we have only determined what would be a safe dose for a turkey as we have not had a case to try it on without interfering with our other experiments. It has been found that the hypodermic injection on four successive days of amounts increasing from 1 c. c. to 2 c. c.'s of a 4 per cent solution have not been followed by untoward result.

ACTIVE IMMUNIZATION.

It was thought that the injection of extracts or emulsions of diseased liver might assist in the treatment of the disease by helping to create an active immunity. It has been found, however, that injections of saline extracts have no beneficial effect while the injection of liver emulsion apparently increased the severity of the cases on which it was used, probably by causing a severe anaphylactic reaction.

Provision has been made for the further pursuit of this very important and interesting problem. We anticipate being able to arrive at more tangible conclusions in our projected experiments as a result of the experience already gained. We would point out, however, that in the last report of the Director of the Rhode Island Experiment Station, he states that they seem to have made comparatively little progress in overcoming the ravages of this disease. The work was commenced at the Rhode Island Experiment Station in 1894 by Dr. Theobold Smith and has since been continued under the direction of various investigators. Apart from the very valuable data secured by Theobold Smith there has been very little in the findings from time to time reported from this station, having a bearing on the practical measures to be adopted in overcoming this affection.

CONCLUSIONS.

1. Entero-hepatitis or black-head in turkeys is a disease affecting the liver and cæca (blind guts) caused by the amœba meleagridis, described by Dr. Theobold Smith in 1894-5.

2. Recovery from an attack during the first season may be followed by one or more attacks during that season through which they may or may not pass in safety. Turkeys after one year of age rarely show evidence of the disease, yet on autopsy may present lesions.

3. Turkeys [as outlined in (2)] may pass through an attack of this affection, after which they are chronic carriers of the infective agent for an indeterminate period.

4. Treatment of affected birds may or may not be effective. Muriatic acid has given good results but is not infallible. It can be used without fear of untoward results. Emetine hydrochloride has been effective in a few instances but is too dangerous for general adoption and can only be used under skilled direction.

5. The hatching and rearing of turkeys by artificial means on uninfected ground and away from other fowl gives promise of a means for overcoming the ravages of this malady.

6. All weak or inferior poults should be destroyed at once and none but the most vigorous individual birds retained for breeding purposes.

APPENDIX No. 19.

(E. A. Watson, V.S., Pathologist in charge.)

VETERINARY RESEARCH LABORATORY,

LETHBRIDGE, ALTA.

SIR,—I have the honour to submit herewith my report for the year ending March 31, 1914.

THE SERUM TEST FOR DOURINE.

Unquestionably, the serum test for dourine marks a distinct advance in veterinary science and in the control and eradication of a disease ruinous to horsebreeding.

Last year, in the Annual Report, I described methods of serum testing, and expressed the great value and importance of such means of diagnosing dourine, especially in obscure or latent cases—the tolerant, non-clinical carriers—which, while still capable of transmitting the disease show no visible sign of it themselves.

This year's work commenced with the testing of all quarantined, suspected, or dourine contact animals of which the department had knowledge—animals connected for the most part with dourine outbreaks in Saskatchewan and Alberta in which the identity of the disease had already been established by the serum diagnostic method.

By September, 1913, 247 animals had been tested (districts of Milestone, Sask., Unity, Sask., and High River, Alta.) 24 dourine diagnoses resulting. All clinical cases had been destroyed previous to this test. Nevertheless, veterinary inspectors returning to make a final examination and to dispose of the positively reacting animals found that several of these had broken down in health, exhibiting more or less characteristic symptoms and dourine paralyses.

Having disposed of the above the dourine situation appeared more promising than at any time in the history of the disease in Canada, since the first known outbreak in the year 1904, but it was not to be supposed that the disease had been stamped out. The sero-diagnostic method, constituting as it does the only known specific means of detection in incipient cases, had not been sufficiently long in operation to permit of any such conclusion.

It was feared that unknown carriers of dourine, surviving the earlier outbreaks, might start a recurrence or further distribute infection.

In November, 1913, an outbreak of dourine was suspected in southern Alberta, Inspector Gallivan discovering several cases of disease showing conditions common to dourine. Serum tests were immediately made by the complement fixation and agglutination methods, and a diagnosis of dourine established on the positive reactions obtained. Further investigation proved the outbreak to be a more extensive and destructive one than any this department has had to deal with. Infection was found to be widespread over two of the largest horse ranches in southern Alberta, and through the sales and shipments of animals from these ranches, carried to numerous districts and ranches in the provinces of Alberta and Saskatchewan. These outbreaks have involved an immense amount of investigation and control work, and in this connection the laboratory aid afforded by the serum test methods has proven invaluable. The maintenance and expenses of this experimental station and all the research work that has led up to these present methods of testing has indeed been more than offset by the number of tests and diagnoses made in the past six months.

A final summary of the number of tests made during the year ending March 31, 1914, follows:—

Total number of serum tests for dourine	4,015	
Including—		
Complement-Fixation tests	3,200	
Agglutination tests	730	
Precipitin tests	85	
	4,015	4,015
Number of sera giving positive reactions to dourine		512

Accordingly a diagnosis of dourine was made on the 512 animals whose sera gave specific reactions to the test. Evidence of the reliability of these diagnoses has been given in numerous instances by the veterinary inspectors in charge of the field work, who report that in every case where some symptoms were noted at the time blood was drawn and sent to the laboratory, the test report was shown to be positive. Further, that in many cases in which no sign whatever of the disease could be discerned when blood was collected, but in which the serum reaction was also positive, there ensued within two or three months well defined stages of disease, in some cases death taking place before the animals were finally removed for slaughter.

The early diagnosis of this disease is the all-important factor in the work of control; in this lies the great value of the serum test. The specific serum reaction can be ascertained long before any symptomatic evidence of disease is presented. The incubation period of dourine is, however, in some cases, very prolonged, and it appears advisable not to consider a negative reaction as final unless three months have elapsed since the last possible date of infection. Among the sera tested we have found a few to give a weak, partial, or questionable reaction. These are retested after an interval of about two months, and in several cases we have obtained strongly positive reactions at this second test.

It is gratifying to be able to report that horse owners in the dourine-infected districts are expressing their satisfaction with our present methods of diagnosis, and are intelligently co-operating with the officers of this department in the work of stamping out the disease. The fact that, as mentioned above, in numerous instances a serum diagnosis of dourine in an apparently healthy animal has been confirmed by subsequent developments of the disease, together with the fact that all clinical cases also gave a positive serum reaction (in the great majority of cases the tests were made and diagnosis given before any reports were received from the inspector in the field as to the condition of the animal) has served to impress owners with the accuracy of the test. Several of the largest horse owners whose herds we have tested have personally visited the laboratory to see some tests carried out, and have expressed their appreciation of the work the department is doing in the interests of horse breeding. Every week letters are being received and requests made to the inspectors for tests of breeding studs; whereas in past years, it was very difficult matter to obtain information with regard to such animals, and control work was hindered rather than helped by the parties interested.

Arrangements are now being made for the testing of all stallions used for breeding purposes in the dourine-infected districts, and, of course, of any mare that comes under suspicion. In this way the earliest possible knowledge of a fresh infection can be ascertained, and further spread prevented.

We are also proceeding to test the horses on the Peigan and Blood Indian reservations. Already, by the serum test, we know that a number of stallions on these reserves are infected. Compared with the better breeds of horses, the Indian pony breed is very resistant to dourine, easily tolerating an infection. Clinical cases are rare, and the mortality is very light. But there is no doubt that the virus of dourine

exists and is harboured on these reserves, the conditions being most favourable for its maintenance. Numbers of horses stray on to and off the reserves, and in such manner a channel for the passage of dourine to other districts is easily made.

The serum testing of horses on a very large scale indeed must be undertaken to keep down the disease and stamp it out. The new laboratory which has been running for a year past has made possible a systematic testing of all suspected and dourine-contact animals, but only by untiring and extraordinary efforts have we been able to carry out the large number of tests required.

The work is extremely arduous and necessitates long hours of application and continuous attention to the innumerable but all-important details of technique. With daily practice and experience one becomes expert with these serum test methods which, however, are so delicate and sensitive to a varying technique and changed conditions that only an expert worker should apply them and interpret the results. In inexperienced hands apparent contradictions occur which really are not contradictions at all but are the result of faulty interpretations of the preliminary tests and wrong estimations of the titres and properties of the different re-agents.

Serum test methods for dourine were described in detail in the last annual report in my paper "The Serum Re-actions and Serum Diagnosis of Dourine." These still hold good, but for testing sera on a large scale, in lots of 100 or more at a time, certain modifications have had to be introduced, together with more speedy methods of procedure.

NOTES ON AND PROCEDURE NOW FOLLOWED AND RECOMMENDED IN THE SERUM TEST FOR DOURINE.

Collecting blood.—To ensure specimens arriving at the laboratory in as sterile a condition as possible, vials, needles and attachments are prepared and sent out as required ready for immediate use, also directions as to the manner of drawing blood and storing. (See directions reprinted herein.) Neither carbolic acid nor any preservative is to be added to the blood. When laboratory vials are used, and the directions followed, the specimens are always received in proper condition for test.

DIRECTIONS IN COLLECTING BLOOD FOR SERUM TEST.

Vials, needles, and attachments are supplied by the laboratory, sterilized and ready for immediate use. Blood should be drawn from the jugular vein. The site is prepared by clipping off the hair and sponging a broad surface with carbolic solution or other disinfectant. Swell the vein by cording the neck fairly tight and nick the skin with a sharp pair of clean scissors. Spread open incision and insert needle into vein and *when blood flows freely* remove cork from vial and *fill to the neck* or within one-half inch or less of the lower surface of the cork.

Do not add carbolic acid or any preservative to specimens.—A vial should be filled quickly with freely flowing blood, not in driplets. When filling, the cork should be protected from dust or contact with unsterilized surface. It may be held within the sterilized wrapper of the vial. The rubber tubing and nozzle are provided so that the flow of blood may be stopped by compressing the tubing when the nozzle is entering and leaving the vial. Immediately after filling the vial write on label identification number, your initials and the date. Then leave to stand upright for fifteen to twenty minutes, or until the clot is formed. If left overnight, keep in a cool place. Forward to the laboratory, together with report on Health of Animals Form 46 and serum test Form 61, the latter in duplicate (copy attached).

Avoid taking blood when animal is in a febrile condition.

When laboratory vials are not available, take any 1-ounce bottle, wash and clean thoroughly, boil in water, drain and dry in a hot oven for one-half to one hour. Corks should be moistened and dried in the oven at same time, and inserted into the bottle while the latter is still hot.

5 GEORGE V., A. 1915

H. of A. Form 61.

DOMINION OF CANADA.

DEPARTMENT OF AGRICULTURE HEALTH OF ANIMALS BRANCH.

SERUM TEST REPORT.

Owner..... Address .....

Serum No.	Vial No.	Animal No.	Temperature.	Age	Sex	Name of Animal or Identification Marks.	Nature of Disease Remarks.	Serum Reaction.

Date.....

Inspector.

Remarks.....

.....

Pathologist.

.....

On reaching the laboratory the vials are placed in the refrigerator for twenty-four hours or longer until the clot and corpuscles have settled and the serum has become clear. The serum is then decanted into small sterile test tubes, allowing about 5 cubic centimetres for each sample, numbered again for identification and stored in the refrigerator until wanted.

Inactivation.—Normal horse serum when fresh and unheated or on storing for any length of time is frequently found strongly anticomplementary. Such properties have to be destroyed by heating the serum, for otherwise a non-specific fixation of the complement may be obtained. The temperature necessary to destroy the anti-complementary properties of the serum but not to interfere with the specific dourine antibodies that it may contain, we have found by exhaustive experiments to be at 58 to 59 degrees centigrade, maintained for one half hour. Under 58° C. the anti-complementary action is not wholly destroyed and may be sufficient to interfere with the test. When heated for half an hour at 60° C. and above specific dourine sera very weak in antibody content may lose its combining properties and so fail to give the reaction required. On the other hand, dourine sera strong in antibody will resist heating even to 62° Centigrade.

Inactivation is therefore a very important step in the complement fixation test. It should be carried out by including with the unknown sera the sera of two or more

known normal healthy horses, as well as the sera of two or more known dourine infected horses. The latter or positive control serum should include one strongly positive serum and one weakly positive serum. Altogether, at one and the same time and on the day that the test is to be made, the unknown sera and the control sera are heated in a water bath for one-half hour at a temperature maintained between 58 and 59 degrees Centigrade, inactivation being thus effected and controlled by the strong positive and weak positive sera, as well as by the normal but anticomplementary negative sera.

Antigen—Antigen for the complement fixation test is most conveniently obtained in the fresh spleens of dourine-infected rats. Dourine strains, however, differ in their antigen-producing properties. A strain that will kill white rats in four days is a better antigen producer than a strain that takes six, eight or more days to kill a rat. As soon as the rat is dead the spleen is removed and kept on ice. The strongest and most suitable antigens are obtained with spleens not more than twenty-four hours old, though two and three days old (kept on ice) spleens can be used. For titration and testing, a spleen is ground up into a fine paste, gradually adding 0·85 per cent salt solution until a fine emulsion is obtained, then filtering out the coarser material. One spleen will furnish 30 to 50 c.c. antigen solution which usually titres out at between 0·15 and 0·30 c.c. in the presence of dourine antibody. Two or three spleens should be titred separately, at one time, against a known dourine serum (positive serum) and a known normal or dourine-free serum (negative serum), and that spleen emulsion which effects complete antibody-antigen combination in the smallest dose selected for the test.

Hæmolytic System.—This consists of:—

Complement: Fresh guinea-pig's serum, not kept over 48 hours.

Amboceptor: Anti-sheep rabbit serum, titering at 1:3000 or higher, not less. Good for several months.

Blood Corpuscles: 4 per cent suspension of sheep's blood corpuscles, not kept more than 3 days.

The Complete Test.—This must be commenced as soon as the titres of complement and antigen have been determined and carried out the same day.

When a large number of sera are to be tested, the complete test is best carried out in a double series on two successive days. Thus, in the first series only one tube is used for each serum tested, this tube containing the full or slightly excessive dose of 0·2 c.c. serum. The usual known positive and negative controls are included, and controls for the hæmolytic system. On the results obtained one is enabled to eliminate at once all negative sera, that is all with which there is given complete hæmolysis. On the other hand, any serum which causes slight, partial or complete fixation of complement is recorded as such and subjected to a more complete and exhaustive test on the following day. In this, the second series, the serum is freshly inactivated and a dose of 0·15 c.c. used both for the test proper (with antigen) and for the serum control (without antigen). Further, sera which in the first series may have given partial or questionable reactions are tested in this second series in graduated doses of 0·2 c.c., 0·15 c.c., and 0·1 c.c. At the same time that this second test is being made a fresh batch may, of course, be undergoing the first test.

In this way not only can a much greater number of sera be tested in a given time but there is a great saving in the material used and, of still more importance, every positive and questionable serum is tested twice over with different stock preparations of complement, antigen, and amboceptor, these being freshly prepared every day.

With the above procedure there is usually no difficulty in arriving at an accurate interpretation of the reactions. Should there still remain questionably reacting sera the agglutination test is applied, or the case is held over for a few weeks and fresh serum obtained and retested.

SWAMP-FEVER RESEARCH.

The investigation of swamp-fever continues and many interesting experiments and observations are recorded.

In August, 1913, five horses with a history of swamp-fever were shipped to the laboratory from the Saskatchewan University, Saskatoon. Earlier, in April, a horse in an advanced stage of the disease was received from Lebrett, Sask. These, together with fourteen experimental horses, making twenty swamp-fever subjects in all, have furnished valuable material for study. Unfortunately, it became impossible to give the necessary time to this research or to take advantage of the many opportunities for experiment, on account of having to give practically the whole of my time to the laboratory diagnoses of dourine. Consequently, the investigation has been of a somewhat desultory character and in the chain of evidence being built up there are many missing links. I hope it will be possible for me in the near future to correlate the various facts and observations already noted, and to submit a detailed report for publication.

It may be mentioned now, as of especial interest, that the virus of swamp-fever persists in the blood and body fluids of horses that have survived infection, for more than a year, possibly several years. The blood of four of the naturally infected Saskatchewan horses, these horses appearing in quite normal health, is very infective for healthy horses. In three experimental horses such blood by injection caused typical swamp-fever and death in two to three months. There are thus non-clinical carriers of swamp-fever comparable to the non-clinical carriers of dourine. These carriers are themselves more or less immune, reacting but slightly or not at all to large injections of virulent blood.

Numerous attempts have been made to infect laboratory animals with swamp-fever, but without any success. The horse appears to be the only animal capable of infection, but this of course is uncertain while the nature of the virus and its mode of transmission in nature remain unknown. As a test, the inoculation of animal species other than the equine is useless. There seems to be a possibility of obtaining precipitating sera from hyperimmunized horses, and I am working along this line with the view of arranging a method of serum diagnosis.

During the year the following veterinary inspectors have been detailed for short periods of duty at the laboratory. Inspectors Busselle, W. L. Hawke, Wickware, Munroe, Christie and Hilliard. Inspector W. L. Hawke returned to the laboratory in November, 1913, to assist in the serum diagnosis of dourine, with which he is now an expert worker.

In September, 1913, with the authorization and in the company of the Veterinary Director General I attended the meeting of the American Veterinary Medical Association in New York, the privilege being much appreciated. At this important meeting the control of glanders, hog-cholera, dourine, and contagious abortion was thoroughly inquired into, and many other subjects of interest to this department.

I hove the honour to be, sir,

Your obedient servant,

E. A. WATSON,
Pathologist, Veterinary Research Laboratory

SESSIONAL PAPER No. 15b

APPENDIX NUMBER 20.

(W. L. Hawke, V.S., Inspector.)

MEDICINE HAT, ALTA., March 31, 1914.

AN OUTBREAK OF DOURINE.

The outbreak of dourine in the Unity district of Saskatchewan, being the first extensive outbreak in that province proved interesting as well as instructive to me in more ways than one.

In the first place, interesting owing to the controversy of opinion expressed at the outset by different inspectors as to the nature of the disease, making it difficult to arrive at a safe diagnosis.

Later in an effort to arrive at some definite conclusion as to the real nature of the disease, the services of Dr. Watson were called in, who, after having obtained specific dourine reactions by serological methods with serum taken from suspected animals, as well as isolating the specific organism of dourine (*trypanosoma equiperdum*) in a suspected animal, proved conclusively the nature of the disease.

Again, from the very mild form of the disease in its early stages as evidenced by the lengthy period of tolerance or resistance in the majority of animals infected—in most cases two to three years. Then, when typical clinical symptoms finally appeared, the infection showed marked virulence and the animals soon broke down completely.

Again, doubly interesting, being as this was the first time in which the serological methods of diagnosis of dourine employed at the Veterinary Research Laboratory, Lethbridge, were made of practical use in dealing with an extensive outbreak in the field.

Having had charge of the field work in connection with this outbreak from date of first quarantine in December, 1911, until last quarantine was raised in July, 1913, I had the opportunity of keeping all suspected animals under close observation. I also assisted with the testing of the serum collected from said animals. So that I was afforded an excellent opportunity of gaining a practical insight into the nature of this insidious disease, as well as of the methods employed in serum diagnosis.

In this outbreak the stud Florus proved an interesting case. The mare which first aroused suspicion as to the existence of some serious disease, which later led to an investigation by the department, together with three or four other mares later found in a similar condition, were all covered only by the above stud some eighteen months previously. The condition of these mares formed the basis on which the early diagnosis was made, and though such symptoms as could be noted were by no means clear or decisive, the infection if it existed, must have been spread by the stud Florus, in the breeding season of 1910, in which one would naturally expect to find evidence of disease, especially after such a lengthy interval. Further, the animal was a pure-bred Belgian horse, and it has been generally experienced that pure-bred animals, especially stallions, do not show any marked resistance to infection, but, on the contrary, show very severely the inroads of disease and the characteristic conditions of dourine. However, at this time said horse remained, one might say, in perfect health, showing no symptoms on which a clinical diagnosis of dourine could have been made, even by the most experienced observer.

The absence of symptoms in this horse is what led to the controversy of opinion in diagnosis at this time.

The stud still remained in good condition for some time after giving a specific dourine reaction to serum test, until finally typical symptoms of dourine infection appeared, which developed quickly, the animal being destroyed in the spring of 1912, a total wreck.

By July of 1912, eight animals had been destroyed, in four of which clinical symptoms sufficed for diagnosis. The other four were positively diagnosed by the serological methods, but were held over for a period and destroyed when marked dourine symptoms appeared. The contact animals, numbering sixty-seven, were kept in quarantine until the following spring (1913) when a serum test of each was made. Those giving positive reactions were destroyed, and those negative released. Different mares suspected of being diseased on slight symptoms presented at time of taking blood for serum test, gave positive reactions, while others—two in particular—at this time presenting no noticeable symptoms of disease, yet gave specific reactions to the serum test, which two, on my returning to destroy the reactors about six weeks later, presented marked clinical symptoms of dourine.

In no animal whose serum gave a negative reaction were clinical symptoms ever observed. Other animals which had been reported as positive reactors, sooner or later revealed typical dourine conditions. Thus the serum method of diagnosis gave convincing proof of its reliability. Certain mares apparently healthy, clinically, and in good condition, reacted and were destroyed. These no doubt, were more resistant animals and carriers of the disease, and apt to spread infection further. This I consider one of the most important features of the serum test. That is in demonstrating the immune carriers, which I think are more numerous than has been generally suspected, and much more dangerous than a clinical case owing to the fact that the former might be passed as healthy, even after months of close observation and without any negligence on the part of the inspector, and still be capable of transmitting the disease.

The train of symptoms noted in the infected animals throughout the outbreak, in the tolerant stages were very mild, such as slight œdemas in the abdominal and vulvar regions, while the terminal lesions were suggestive of a very virulent infection, nervous lesions predominating, especially of the ears, lips, throat, and larynx, the latter being marked, causing great difficulty in breathing, with a roaring sound. Paralysis of the hind quarters was noted but not marked. No plaques were ever observed.

Two mares enjoyed perfect health until shortly after foaling, when both broke down suddenly, one showing extensive œdema in the region of the vulva and in the mammary gland, as well as ocular lesions. The other presented loss of nerve control.

As to the source of infection in this outbreak, it has not been possible to state definitely where it originated, although every effort was made to do so. This was made more difficult owing to the length of time the disease had been prevalent in the district before being brought to the attention of the department.

In my opinion there are two feasible sources through which infection may have occurred.

First to the fact that a number of horses were brought into this district and sold among the settlers, which horses mostly came from the Medicine Hat district, where dourine had been quite prevalent a few years previously. Among these may have been a latent case of dourine or an immune carrier, which transmitted the infection to the stud Florus.

Again, the stud Florus, being imported in the spring, coming originally from Belgium and being a short while in the United States before coming to Canada, may have contracted the disease in either of the former countries, thus bringing the infection to the Unity district. This being possible, owing to the fact that the horse later proved to be a very resistant animal, or the infection being of a mild form in the early stages, the animal was imported without suspicion.

W. L. HAWKE

APPENDIX No. 21.

(Seymour Hadwen, D. V. Sci., Pathologist in charge Veterinary Research Laboratory, Agassiz, B.C.).

March 31, 1914.

SIR,—I have the honour to submit to you this my report for the year ending March 31, 1914.

I am pleased to report that this year a distinct advance has been made in the study of bovine hæmaturia. As this laboratory was built primarily for work on this disease, it is natural for me to speak of it first in my report, though several other important investigations have been undertaken during the year.

I desire to record my great appreciation for the assistance of Mr. G. H. Unwin, B.S.A., who has been with me since my return from Europe in October. As an appendix to my report, I attach an article on "Milk Bacteria," written by Mr. Unwin. This work was done early this year, and brings out some practical points in connection with the handling of milk. The addition to the laboratory has facilitated the work very much, as the old quarters were getting much too small. The numbers of specimens sent in for examination have increased. I will only mention a few of those which are of special interest.

In conclusion, I wish to thank you for the great interest you have shown in our work, and of your granting me leave to visit Europe in order to study hæmaturia. I am convinced that journeys of this sort are almost a necessity to men doing research work, especially to those who are cut off from the rest of the world for months at a time.

I have the honour to be, sir,

Your obedient servant,

SEYMOUR HADWEN.

A STUDY OF HÆMATURIA IN FRANCE AND OTHER COUNTRIES.

After reading the different articles on hæmaturia which have been published abroad, I thought that I had only to go to the country the disease was described in to find cases. I had read of the affection occurring in Belgium, but, on reaching Brussels, I was disappointed in learning from the officials at the Royal Veterinary College there that they could not for the moment direct me to any cases, and that the disease only occurred sporadically in Belgium. I journeyed from Brussels to Lille in the north of France and made further inquiries there, but was again disappointed. I wish to record my appreciation for the courtesy and kindness of M. Rivière, Secretary of the Societée Veterinaire du Nord, who gave me the addresses of veterinarians in different parts of France, and much other valuable information, which was of great assistance later on.

In Paris, at the Veterinary College of Alfort, I met Professor Moussu who at last gave me the information I wanted. I cannot thank him enough for the trouble he took about me; it was through him that I obtained letters of introduction to veterinarians living in the centre of France, in the departments of the Indre, Creuse, and Correze. Here I found the disease in as bad a form, and as common as it is in British Columbia. The journey from Paris to the centre of France was made by road; this I

was enabled to do through the courtesy of Dr. E. Hindle, of Cambridge, who brought over his motor from England and accompanied me on the trip. In this way we were able to visit the remote country districts in a manner which would have been impossible by train in so short a time, or so economically. In fact, I may say that I could not have afforded such a lengthy trip but for Dr. Hindle's kind offer.

Much to my surprise, a great deal of the country in these departments has been brought into cultivation only in recent times. The country is hilly, and the land is patchy; in fact, one can say that in many respects it resembles British Columbia. There are good districts and poor ones; it is in the poor ones that hæmaturia is to be found. In some parts of the country I visited, where agricultural conditions were improving, the disease was disappearing; this bears out my contention about the disease in British Columbia.

My first letter of introduction was to M. Rousseau, veterinarian at Le Blanc; this gentleman kindly placed his car at my service, and together we visited a number of farms where there used to be many cases of hæmaturia. M. Rousseau told me that the disease was disappearing in his practice, and that of late he had only about ten cases per annum; it was evident that agricultural conditions were improving rapidly round Le Blanc.

At Argenton, M. Perrot took me to visit a gentleman farmer near there who informed me that he had purchased his farm eighteen years ago; that when he bought it, the land was in very poor tilth, 50 per cent of the animals on it had hæmaturia. Little by little, under improved methods, the disease had diminished, and, for the past six years, there had been no signs of the disease. Phosphate of lime has been put on the fields, ditches have been dug, better stables put up, and the animals have received better care. While examining the cattle on this farm, I captured a female *Ixodes ricinus*. This tick is the carrier of piroplasmosis or tick fever. M. Perrot told me that he had treated animals for this affection on this very farm, and that the two diseases, piroplasmosis and hæmaturia, occurred in his district. He told me that for piroplasmosis he used the Nuttall-Hadwen treatment with Trypanblau and that he found it successful.

The next district I visited was the country around Aigurande (Indre), where M. Lafaye kindly piloted me. On the first farm we went to the owner told us that five of his steers and two cows developed hæmaturia in the space of one year, their ages running between four and seven years. I examined the two cows and found that the symptoms tallied absolutely with those I have found here. On the next little farm we saw four cows which were all affected; this we proved by passing the catheter. The tenant on this farm was in despair, his land was poor and his cows ill, so he talked about leaving the place. M. Lafaye explained his method of diagnosing these urinary affections, which was simplicity itself. He requests his client to bring him a sample of urine, which he puts on one side and allows to settle. In cases of hæmaturia the sediment is blood-red and packed tight; the supernatant liquid looks like ordinary urine. In piroplasmosis (or hæmoglobinuria), the sediment does not settle so well, and the supernatant fluid remains dark. M. Lafaye told me that he had diagnosed hæmaturia and piroplasmosis occurring simultaneously in the same animals. In cases of this sort he treated the animals first with Trypanblau, and, when the fever had subsided, for hæmaturia.

From Aigurande I went to Benevent. M. Fouriaud, the veterinarian there, in common with all other veterinarians I met, treated me with great kindness. It is only in the last eighteen or twenty years that the country round Benevent has been brought into cultivation. Hæmaturia is decreasing as the land gets cleared up and better cultivated. All the veterinarians with whom I spoke agreed that there were more cases of hæmaturia on high land, and fewer along the river bottoms. M. Fouriaud told me that he did not treat cases, as it was so unsatisfactory to himself and to his clients. He said that the universal practice was to keep an animal for a year after

it began to show symptoms, and then to butcher it. This is quite in accord with my own ideas, for animals rarely die for a year after the symptoms show. The affected animals are sold for beef, but, if they are in poor condition, they go to the packing-houses. One great drawback to the treatment of the affection in France is that cattle are used for work, even the dry milch cows, and this tends to hasten the course of the disease. I have already pointed out that exercise invariably aggravates the malady and causes the bleeding vessels in the bladder to pulsate more rapidly. M. Fouriaud told me that, during the winter months, not a week passes but several affected animals are slaughtered at Benevent.

Besides studying all the cases of hæmaturia I could find, I made notes about the vegetation on the various farms I visited. The uncultivated lands showed a vegetation quite different from that of this province; the only similarity was on cultivated lands. I found most of the cases on badly managed farms. These farms were in need of money being spent on them for drainage, cultivation, and, above all, it seemed to me, for lime to check the acidity of the soil. Much of this land is wet and sour and the grasses and weeds reminded me of places I had seen in British Columbia.

To sum up, my trip was a decided success. I found that hæmaturia, as it exists here, is identical with the French form; that it is very improbable that one special plant causes the trouble, because the vegetation in the two countries differs so much. Finally, the knowledge I gained on this journey helped me greatly, and gave me some of the ideas which were useful later on.

THE NATURE OF THE FOOD CATTLE EAT WHEN WANDERING AT LARGE IN THE FORESTS OF BRITISH COLUMBIA.

When I first began investigating this disease, I was living on a farm at Mount Lehman, B.C. The cattle in this district were housed during the winter months. As soon as the vegetation began to show in the spring, the young animals and dry cows were turned out. They had to subsist entirely on what they could find in the forest. The milk cows were turned out also in the daytime, but were driven home to be milked at night; they were then tied up until morning: these animals were usually given some food to supplement what they got in their daily wanderings. About the earliest plants to come out in the spring are the bleeding-heart (*Dicentra*), and the deer-grass (*Achlys triphylla*): these two plants are eaten with great avidity by cattle; later in the season, I have found it impossible to say exactly what plants or leaves of trees form the main part of their ration. This study is a most puzzling one; I have often followed the cattle for hours to try and find out what they were eating, and finally came to the conclusion that there were hardly any plants or shrubs which came amiss to them. They would snatch a bunch of leaves, then some grass, a bit of skunk cabbage, a few leaves from an alder tree, a willow, or some small plants; in fact, a bit of everything; so I decided that if the vegetation was the cause of hæmaturia, then it was more likely to be a group of plants rather than a single species; if, on the other hand, one plant was the cause of the trouble, it would be possible to find out by a process of elimination. I have made a few preliminary experiments of this sort, which I will now explain.

STUDIES IN PLANTS.

The first experiments were made with the two plants I mention above. Extracts of *Achlys triphylla* were made by boiling, and the extracts injected into rabbits in a most concentrated form; it had about the consistency of treacle; 5 c.c. doses produced no effects.

An extract of *Dicentra,* boiled down to a syrup, was injected into a rabbit and a guinea-pig; they received 4 cc. and 3 cc. respectively. The effects were nil, except for

causing the animals to become drowsy. I am informed that this plant used to be classed with the *Papaveraceæ*, and is a class relative, which accounts for its soporific effect.

An extract of alder was made by boiling down two hundred grams of the tip of the shoots, including the leaves and the fruit; this extract was concentrated to 50 cc., and 5 cc. were injected into two rabbits. No toxic effects followed these injections.

EXPERIMENTAL FEEDING OF BRACKEN ("PTERIS AQUILINA").

Many farmers hold the view that this plant is the cause of hæmaturia. The theory which is most commonly believed is that the spores, dropping on to the grass, or ripening in the cut hay, are eaten by the cattle. The following experiment really shows that the spores are quite harmless, even in large doses. The only reason I can see for this belief having spread is that hæmaturia is common on land where fern abounds, that this land is invariably ferny until it has been under cultivation for some time. Another proof that bracken is not the cause of hæmaturia is that one finds it growing in many places in this and other countries where the disease does not exist.

PROTOCOL OF EXPERIMENT.

Day 1. Calf given 10 grams of fern spores in milk.
" 2. Calf given 10 grams of fern spores in milk.
" 3-8. Calf given 20 grams of fern spores daily in milk.
" 9. Calf given 30 grams of fern spores in milk.

A total of 150 grams of fern spores was given. This is a large quantity, as the spores are very light and filled two pint jars.

Day 88. Calf killed. All organs normal.

ARGUMENTS IN FAVOUR OF THE THEORY THAT PLANTS CONTAINING OXALIC ACID ARE THE CAUSE OF HÆMATURIA IN CATTLE.

The cause of hæmaturia has long been looked for in vain; many theories have been advanced and refuted, so that it is natural for me to be conservative in what I am about to say, and in interpreting the results of the experiments I have lately been conducting. Before going any further, I should like to mention the valuable help given to me by Dr. W. E. Dixon, the noted toxicologist of Cambridge University; he it was who helped me to formulate the ideas I now hold on the subject.

These experiments, to my mind, are very encouraging, and my field observations back them up, so that I feel much more satisfied concerning the outlook of controlling hæmaturia than I ever did before. Experiments were undertaken to prove that oxalic acid in plants played an important part in producing hæmaturia in cattle. The experiments were divided under two heads; one the injection of calcium oxalate crystals into the bladder, the other the feeding of oxalic acid by the mouth.

In experimental injections into the bladder of calcium oxalate crystals, the animals evinced great irritation, and, after several injections, made on consecutive days, straining became more marked and finally bloody urine was passed. This proves conclusively that calcium oxalate crystals can wound the walls of the bladder sufficiently to cause hemorrhage. These experiments have been made with four different animals.

Calcium oxalate crystals have been demonstrated in many cases of hæmaturia in this country, and I found them also in a specimen I brought back with me from France. Their numbers are often small, but I have already shown that the disease takes, on an average, six years to develop; thus it is probable that the constant irritation of these crystals, even when present in small numbers, may eventually produce hæmaturia. Nearly all the experimenters who have worked on hæmaturia say that the bladder lesions are undoubtedly the result of prolonged irritation. An interesting point

which I have not seen mentioned is the fact that the majority of the lesions found in the bladder are in the most dependent parts; this likewise suggests that the irritant falls to the lowest parts of the organ in the same way that calcium oxalate crystals fall to the bottom of a beaker.

The results of feeding oxalic acid by the mouth have not been as satisfactory in producing hæmaturia as the foregoing method of injecting crystals into the bladder. Oxalic acid is toxic for the first few doses, but very soon the animals develop a toleration for the drug and can take very large doses. The effects on the urine are apparent from the first. Albumin is seen, and epithelial cells become numerous after sedimentation. Red blood corpuscles also appear in smaller numbers; in some cases they are in sufficient quantities to be visible to the naked eye. Calcium oxalate crystals are numerous. Three calves and a cow were experimented on. It is a fact that, under natural conditions, young animals under two years of age rarely contract the disease. In my own experience I have never seen such a case, but have heard of one or two at eighteen months. This age limit supports my theory, because young animals which drink milk are not affected. At first they do not take green food at all; later when they begin to do so, the lime which is in the milk would be sufficient to cause the oxalic acid in the plant to be turned into calcium oxalate and eliminate it as such in the foeces. It is possible that the hydrochloric acid which is present in the digestive juices may be strong enough to act on some of the oxalates found in the plants, converting these into oxalic acid. If this is so, the lime would neutralize this effect. No experiments have been made to prove or disprove this point.

In the experiments I have been conducting of giving oxalic acid by the mouth, a large percentage of it must be eliminated in this way; but, when there is too much for the lime in the food to act on, a certain amount of the free acid must be absorbed; hence the crystals are probably formed somewhere in the urinary tract, when the acid comes in contact with the mucous or other fluids which turn it into calcium oxalate. Arguing from this point, one would expect to find that animals which are given oxalic acid would be stunted and not grow like other animals. This is undoubtedly the case; the animals one finds in the red water districts, if born and raised there, are usually under-sized. Experimentally, I have proved this in the case of two young bulls.

In treating cases of hæmaturia, I have found that lime salts, such as calcium chloride, calcium lactate, and ordinary lime, help animals. In several cases I have seen the blood clotting properties raised. These drugs at one time were largely used in cases of hæmophilia, but now are not held in much esteem. It may be that the improvement I noticed was in reality produced by the action of calcium on the oxalic acid, as it is well known that oxalic acid retards the coagulation of blood. Medical men have long known that acid fruits and vegetables are harmful to some people, and there is much literature on the subject.[1] I have heard of cases where the ingestion of rhubarb caused smarting and burning after urination, and occasionally red cells were found on sedimenting the urine. In cases of oxalic acid poisoning in man, hæmaturia has been seen and bleeding along the alimentary tract. During the course of my experiments I have observed the irritating nature of the crystals, and have seen blood-stained saliva coming from the mouth, and bloody faeces. These are the main facts I have learned from my experiment; in the field, my observations also lend support to them. On this very farm, twenty years ago there used to be many cases of hæmaturia. The land was then newly cleared, and I am told that all the fields were very sour; it is now fourteen years since there has been a case. I could mention very many cases of this sort. Hæmaturia is undoubtedly a poor man's disease, and occurs in new districts. I have seen the disease leave a farm in two or three years, notwithstanding the fact that the descendants of the original cattle remained on it. This disappearance followed clearing operations and cultivation. On other

[1] A very complete list of references on Oxaluria may be found in Noordenss' "Metabolism and Practical Medicine," vol. 3, pp. 1053-1054.

farms, where the disease is more or less permanent, one finds that the cattle are still allowed to roam at large in the woods or in partially cleared lands; but, as soon as the owner keeps his animals under fence, cultivates his land and feeds them better, the disease vanishes.

A curious and very important fact, which is well known to the farmers of this province, is the absence of hæmaturia on the Delta lands at the mouth of the Fraser river. The reason for this is obvious; the land forming this delta came from the uplands of British Columbia, which are of a totally different character; no cases of hæmaturia are to be found on the inland plateaus. I am told by horticulturists that on the delta the wood of the trees resembles that found in the interior of the country, and, certainly from an agricultural point of view, the land is of the very best. There are other river deltas that I know of where one finds an odd case of hæmaturia, but in these cases the source of these rivers was in the coast belt.

One other point I desire to make is that the disease is to be found in many widely separated countries—the Pacific Islands (Case), Australia (Cleland), America, France, Belgium, etc., and in these different countries the vegetation varies tremendously. Plants containing oxalic acid, however, have a world-wide distribution, which bears out my contention that if the vegetation is the cause of hæmaturia, it is not confined to one species of plant.

Many investigators have claimed that hæmaturia was a contagious disease—Detroye, Moussu, Bowhill, and Kalkus.

During the past two years I have experimented on seventeen animals, and have tried to infect them in a variety of ways—by cohabitation, by injecting urine into the bladder, by giving it by the mouth, by the injection under the skin of blood and urine—but without success. From this and other observations in the field, which I have already recorded, I consider the matter settled. I will finish this part of my report by quoting from Moussu's excellent article on the disease. Several references are made to other workers; some of their conclusions are similar to mine, except that they do not go as far. For instance, Pinchon believed its appearance was due to changes in cultivation (clearing), which in 1830 and 1860 completely altered the general appearance of the country. Sinoir had much the same ideas; Boudeaud and Cruzel thought the disease was due to poor feeding. This idea, though quite wrong, owing to the fact that animals may starve to death without showing signs of hæmaturia, backs up my statement that as a rule the diseased animals are poor specimens of their respective breeds. I do not mean that all cases are thin, but they are generally rough animals, receiving little care and attention. In talking over the benefits derived from cultivation, with Mr. Moore, superintendent of this farm, he gave me an idea which I believe is correct. He says that cultivation and reseeding meadows may not check the acidity of the soil, but that it will tend to crowd out the acid plants and that when liming is practised it tends to encourage lime-loving plants, which also displace the acid ones.

In speaking on treatment, Moussu recommends improved farming methods, such as the cultivation of pasture fields, and the application of superphosphate of lime in particular. He says that Boudeaud has seen the disease disappear when these improvements had been put into practice on farms where the disease had been in permanent possession.

PROTOCOL OF EXPERIMENT TO PROVE THAT CALCIUM OXALATE CRYSTALS ARE CAPABLE OF INJURING THE BLADDER AND PRODUCING HÆMATURIA.

A healthy young heifer four months old was selected for the experiment. The amount of crystals injected was the same each time; 20 grams of oxalic acid and 20 grams of calcium chloride were added together in solution. The precipitate was washed free of acid, then sterilized before being injected.

Day 1. Injection given.
" 2. Urine tested with HNO_3 showed presence of albumin, R.B.C., and bacterial contamination. Heifer straining a great deal. Leucorrhoea.
" 3. Urine showed a trace of albumin, a few R.B.C., and many leucocytes.
" 4. Heavy crystalline sediment. Large phosphate crystals, and many leucocytes.
" 6. Urine practically clear, some leucocytes. Injection given.
" 8. Injection given. Albumin, R.B.C. increasing.
" 9. Sediment showed red in centrifuge, numerous R.B.C. Injection given.
" 11. Injection given.
" 12. Sediment showed red in tube. Injection given.
" 13. Injection.
" 15. .1 per cent R.B.C. Heifer shows great irritation.
" 16. .1 per cent R.B.C. First urine passed this morning about 1 ounce, coagulated firmly. The clot was pale and contained few red cells, showing that serum is being exuded from the raw surface in the bladder. This explains the nature of the pale clots so frequently seen in moribund cases of Haematuria; possibly the serum exuded may vary in amount according to the state of anæmia present in the animals.
" 17. Urine turbid. Alkaline, .1 per cent R.B.C. Strips of bladder mucosa in urine.
" 19. Albumin pronounced. Stringy, fibrinous precipitate.
" 20. Blood increasing.
" 21. .1 per cent R.B.C.
" 27. R. B. C. increasing.
" 28. Urine red. .4 per cent R.B.C.
" 29. R.B.C. diminishing.
" 33. R.B.C. increasing.
" 35. .2 per cent R.B.C.
" 37. .1 per cent R.B.C.
" 38. R.B.C. diminishing. Heifer showing emaciation.
" 52. Blood decreasing. Albumin still marked.
" 53. Sudden increase in R.B.C.
" 53-60. R.B.C. present constantly.
" 61. R.B.C. increase to .3 per cent.
" 72. R.B.C. had been decreasing. Urine tinged again on this date.
" 82. Urine tinged pink. Much albumin.
" 83. Injections given on days 83, 85, 87, 90 and 94.
" 103. About .1 per cent R.B.C.
" 112. Injection of crystals.
" 113. Urine tinged.
" 114. Injection given. .2 per cent R.B.C.
" 115. Urine quite red. No percentage obtained. Experiment not yet concluded.

SUMMARY OF EXPERIMENT.

This experiment clearly shows that calcium oxalate crystals, when injected into the bladder caused desquamation of epithelium and bleeding. It also shows that in between times, when the injections were stopped for a while, the damage done to the bladder was not repaired. Three other animals are being experimented on in precisely the same way, and the results are very similar. An important point which has been brought out in this experiment is the fact that injury to the bladder cells may cause serum to be exuded. In studying naturally infected cases, I have often been struck with the paleness of the clots, which were sometimes nearly white. Some difficulty was experienced at first in the manufacture of crystals. Frequently, an amorphous precipitate was obtained after mixing oxalic acid with calcium chloride. The crystals which were produced at other times varied very much in shape and size, and I am led to believe that certain forms have more cutting edges than others. The effects of the injections were not uniform, on one day there would be intense irritation, and on another no visible effects.

PROTOCOL COW NUMBER 2.

Day 1. Calcium oxalate crystals injected into the bladder.
" 2. Urine deep yellow. Albumin present, R.B.C., and leucocytes; also epithelial fragments.
" 4. Crystals injected into bladder. R.B.C. numerous, and leucocytes.
" 5. Albumin. R.B.C., and leucocytes.
" 6. R.B.C., and numerous leucocytes; cystitis indicated.

Day 7. R.B.C., and leucocytes which are decreasing; injection of crystals.
" 8. Sediment in urine red; R.B.C. very numerous, also leucocytes. Injection of crystals.
" 9. .6 per cent R.B.C. in urine after centrifuging. Many epithelial cells; later in the day there was .25 per cent R.B.C. in urine.
" 10. .4 per cent R.B.C. in urine. Large phosphate crystals found in sediment. Leucocytes and epithelium. Later in the day .15 per cent R.B.C. in urine.
" 11. .1 per cent R.B.C. in urine. Cow ill.
" 12. .1 per cent R.B.C. in urine. In the morning, cow was very ill and at 2 p.m. was moribund; temperature, 104; cow shot.

POST-MORTEM NOTES.

Death was due to pyemic infection. Pus was found in the internal organs. Evidence of old inflammation causing adhesions of viscera to the diaphragm, probably of traumatic origin. Bladder much congested, the mucous membrane was eroded in places. The hemorrhagic areas were found mostly in the dependent portions of the bladder.

EXPERIMENTS TO DEMONSTRATE THE EFFECTS OF FEEDING OXALIC ACID.

The calf used in this experiment was a well-grown animal 2 months old on Day 1.

PROTOCOL OF EXPERIMENT.

Day 1. Urine tested. No albumin, no R.B.C., a few epithelial cells.
" 2. 8 grams of oxalic acid given by the mouth.
" 3. Urine normal.
" 4. 8 grams of oxalic acid given; albumin test negative.
" 5. 16 grams of oxalic acid given; urine clouded. Dense sediment of large phosphate crystals; albumin negative.
" 6. Albumin, R.B.C., and calcium oxalate crystals. A few blood casts.
" 8. Urine clear and apparently normal.
" 9-11. 45 grams of oxalic acid given (15 grams each day). No albumin, no R.B.C., calcium oxalate crystals observed on this date.
" 12. 15 grams of oxalic acid given. A few R.B.C. observed in urine. Large phosphate crystals.
" 13. Albumin and R.B.C.
" 14. 15 grams of oxalic acid given. Urine acid to litmus. Albumin present, R.B.C., and calcium oxalate.
" 15. Gave 30 grams of oxalic acid. Urine acid. Albumin, R.B.C., and calcium oxalate crystals.
" 16. Gave 30 grams oxalic acid. Urine alkaline. No albumin.
" 17. Gave 45 grams oxalic acid; albumin negative; calcium oxalate crystals numerous.
" 18. 60 grams oxalic acid given. Albumin negative. Calcium oxalate crystals numerous. A few R.B.C.
" 19. 30 grams oxalic acid given. Albumin marked; R.B.C. numerous.
" 20. 30 grams oxalic acid given. Albumin increasing; urine very acid; numerous shadow corpuscles and unaltered R.B.C. Also epithelial cells.
" 21. 30 grams oxalic acid given; slight albumin, few R.B.C. Calf scouring and off its feed.
" 22. 30 grams oxalic acid given. Calf shows symptoms of poisoning, twitching and trembling, weakness and diarrhœa.
" 23. Drench discontinued; symptoms continue; urine shows heavy sediment; albumin plentiful; oxalate crystals, R.B.C., and leucocytes, also epithelial cells.
" 23-73. 592 grams of oxalic acid were given in 42 doses.
" 73. 25 grams oxalic acid given.
" 75. 25 grams oxalic acid given. Slight albumin, phosphate crystals.
" 76-81. 25 grams of oxalic acid given daily.
" 82. 25 grams oxalic acid given. Urine red. Calf has difficulty in passing it. .3 per cent R.B.C. Many oxalate crystals and no phosphate.
" 83. 25 grams oxalic acid given. Urine pink. .1 per cent R.B.C., many oxalate crystals, no phosphates.
" 85. 25 grams oxalic acid given on this day and on the succeeding days set down in the experiment. Numerous R.B.C. and oxalate crystals.
" 86. Urine tinged, numerous R.B.C. Oxalate crystals and epithelial cells
" 87. Urine still tinged, R.B.C. plentiful.

Day 89. Urine tinged, R.B.C., and oxalate crystals.
" 91. Albumin. Heavy sediment of phosphate crystals.
" 99. Albumin slight. Many phosphate crystals.
" 100. Albumin. A few R.B.C., haemoglobin in urine. Phosphate and oxalate crystals.
" 101. Albumin, dense sediment of phosphate crystals. Colouring matter in urine.
" 104. No albumin, phosphate crystals.
" 105. Albumin, sediment, mostly phosphate crystals.
" 106. Albumin pronounced. Urine cloudy and dark. R.B.C. numerous.
" 108. Urine tinged, albumin and R.B.C. present.
" 109. Albumin heavy, R.B.C. increasing.
" 110. Urine lighter, albumin, R.B.C., and phosphates.

This experiment has been continued and will be carried on to its conclusion.

One of the points it brings out is the fact that when phosphate crystals are plentiful, albumin and red cells are scarce. It would seem that they are an indication of a reaction on the part of the animal against oxalic acid. Pigmentation of the urine was frequently seen as the experiment progressed.

PROTOCOL OF EXPERIMENT TO ASCERTAIN THE EFFECT OF GIVING MAXIMUM DOSES OF OXALIC ACID.

A well-grown calf of 4 months of age was selected for the experiment.

Day 1. 10 grams of oxalic acid given in water. Urine normal. No albumin, no R.B.C., some epithelial cells.
" 2. 10 grams of oxalic acid.
" 3. 30 grams of oxalic acid. Albumin, R.B.C., some pigmentation of urine. Calf visibly affected by dosing.
" 5. 50 grams of oxalic acid. Albumin increasing, few R.B.C., calcium oxalate crystals and amorphous precipitate.
" 6. 60 grams of oxalic acid. Urine alkaline, albumin, a few R.B.C., and crystals.
" 7. 60 grams of oxalic acid. Albumin heavy.
" 8. 60 grams of oxalic acid. Albumin heavy. Numerous epithelial cells. Squamous and kidney, a few R.B.C.
" 9. 90 grams of oxalic acid. Albumin heavy. Numerous epiithelial cells.
" 10. 100 grams of oxalic acid. Albumin, R.B.C., and oxalate crystals.
" 11. 100 grams of oxalic acid. Albumin, urine pale, slight sediment of pure calcium oxalate crystals. R.B.C.
" 12. 50 grams oxalic acid. Light coloured urine. Neutral reaction. Albumin, many oxalate crystals, and epithelial cells.
" 13. 100 grams oxalic acid. Albumin and epithelial cells.
" 14. 150 grams of oxalic acid. Albumin and epithelial cells. Sediment light. Saliva becomes bloody, calf very ill.
" 15. 150 grams oxalic acid. Albumin and heavy sediment in urine.
" 16. 150 grams oxalic acid. Albumin, and heavy sediment, mostly epithelial. Calf died during the night.

POST-MORTEM NOTES.

Ulcers in the mouth and in the œsophagus. The epithelium in the œsophagal gutter was lifted up in places and blood found underneath. The reticulum was ulcerated and there was blood present. Petichial spots were found along the rest of the alimentary tract. A few petichiœ were noticed on the heart. The trachea and lungs were normal; the kidneys were congested, otherwise they showed surprisingly little change. The blood vessels in the bladder were congested. There were no clots in the heart and the blood was black and tarry. The blood was slow in coagulating after the carcass was opened; there were a few clots formed but most of the blood remained fluid. Blood taken in a test-tube at 10.30 in the morning had not fully coagulated at 4 p.m., but set solid before 5.30 p.m. The urine found in the bladder was pigmented, the reaction was acid; there was albumin, many oxalate crystals, and a few R.B.C., also numerous epithelial cells. During the whole of this experiment, the red cells were never very numerous, even when the albumin rose in amount. Oxalic acid crystals were noticed in the beginning, and were always to be

found in the sediment: the most valuable result of the experiment was that it shows how little the kidneys are affected by the drug, even in fatal doses. This was a point I was desirous of finding out, because in all the post-mortems I have made on natural cases, where the disease had not advanced too far, the kidneys looked healthy, except for the presence of renal calculi; these calculi have been encountered a number of times.

NOTES ON THE OCCURRENCE OF PIGMENTED URINES.

In previous reports, reference has been made to coloured urine, which did not contain red cells, being voided by both healthy and diseased animals. The colour varied from sherry to dark port.

The first time the occurrence was observed was in a young bull; this animal was being dosed with urine from a case of hæmaturia in an attempt to infect him. When the animal was killed later on, there was no evidence of infection. Since that time, pigmented urine has been seen a number of times, particularly in the cases of a heifer and two bulls. The instructions which had been given to the stableman who looked after them were to water them twice a day, but it was discovered that he was only doing it once instead of twice; the animals were being stall-fed and got very little exercise. The attacks invariably followed watering (the water they were given to drink came from a mountain stream, and was very cold). A shivering spell generally occurred sometimes followed by colicky pains. After the animals got warm again, urine was voided. The temperature fell below normal at the time of the chill, and temperatures of 99° F. were recorded. Albumin was found in the urine. When nitric acid was added, a wide colour ring developed at the line of contact of the two fluids. When the urine was shaken up with a few drops of chloroform, the pigment was precipitated.

While conversing with M. Lafaye, at Aigurande in France, I was informed by him that he had seen similar cases. On inquiry, I found that they occurred in stall-fed animals during the winter. He said that the affected animals recovered after a few doses of soda bi-carbonate. In natural cases of hæmaturia, the urine occasionally does not return to its original colour after centrifuging; sometimes this is due to ammoniacal decomposition having set in, but it occurs also at other times. No more cases have been noticed in the experimental animals here since they have received better care, until lately, since the experimental feeding of oxalic acid started.

Possibly, in the case of oxalic acid feeding, the pigment is derived from dissolved red cells, owing to the urine becoming acid. However, in the previous cases the urine was alkaline. These observations are mainly of value from a clinical standpoint, in differentiating between the various diseases which bring about pigmentation of the urine.

REFERENCES ON HÆMATURIA.

Case, Leonard N.—1911, Red Water in Cattle. Report of Division of Animal Industry, Hawaii. pp. 199-204.

Cleland, J. B.—1912. A Note on the Occurrence of Pentastomes in Australian Cattle. Report of the Government Bureau of Micro-biology, New South Wales, pp. 120-122.

Cushny, A. R.—1910, Pharmacology and Therapeutics, pp. 410-571.

Hadwen, S.—Hæmaturia. Report of V. D. G., Department of Agriculture, Canada, pp. 57-59.

Hadwen, S.—1911, Hæmaturia. Report of V. D. G., Department of Agriculture, Canada, pp. 136-145.

Hadwen, S.—1911, Proceedings of the Amer. Vet. Med. Association.

Hadwen, S.—1913, Report of the V. D. G., Dept. of Agric., Canada, pp. 74-81.

Kalkus J. W.—1913. A Preliminary Report on the Investigation of Bovine Red

Water (Cystitis). Bulletin No. 112. State Agric. College, Pullman, Wash., pp. 1-27.

Moussu, G.—1911, Traite des Maladies du Betail, 3rd edition.

Roger, D.—1912, Abstract on Hæmaturia in Annales de Medecine Veterinaire. No. 4, p. 229.

TICK PARALYSIS.

RESULTING FROM THE BITES OF "DERMACENTOR VENUSTUS" (BANKS).

For some years past, Dr. Tolmie, Chief Inspector for British Columbia, has been forwarding reports of sheep which were affected with paralysis. This paralysis seemed to recur at about the same period each year. It was thought that the disease might be caused by the animals eating some poisonous plant.

Early in the year, I visited the district from which these reports were coming; it is situated near Keremeos on the international boundary. Full details of this visit and of the subsequent experiments which I conducted at Agassiz on this disease were published in "Parasitology," vol. VI, No. 3, 1913, at the same time a further article was published by Professor Nuttall and myself. I take pleasure in thanking Professor Nuttall for his kindness in placing his laboratory at my disposal for this work.

At this point, I had better explain briefly the nature of this paralytic disease of sheep, and the conclusions arrived at from our experiments. It was evident to me from the first that vegetation was not responsible for the trouble, because the sheep were still feeding on the dry bunch grass, and the spring vegetation had not yet started. On finding numerous ticks upon the sheep, I conceived the idea that possibly they were the cause of the trouble. I captured a number of them and returned to Agassiz, where I placed them on healthy lambs. In a few days, symptoms of paralysis appeared. No bacillus or germ was found in the diseased lambs, nor was it possible to transmit the affection by means of inoculating their blood into healthy animals. On visiting Cambridge in July, in Professor Nuttall's laboratory, we were successful in reproducing the disease in a dog. This was accomplished by placing a single tick on the animal. The tick came from a number which had been collected for me by Mr. Stamford on the mountains near Nelson, B.C.

The most likely theory as to the harmful effect these ticks produced on biting, is that they inject a toxin at a time when they are gorging rapidly; this usually takes place about six days after they attach themselves to an animal. Knowing that the tick is the cause of the trouble, the remedy is simple. The removal of the parasites usually brings about a cure. The disease itself is occasionally fatal, and causes a certain mortality among lambs. Other animals are subject to the attacks of ticks, and, for some time, medical men have suspected them of causing symptoms of paralysis in children.

Since the publication of my article, I have received a paper on this very malady affecting children in Oregon. This was published by Dr. I. U. Temple, of Pendleton, Oregon. He described a number of cases in children. This article, I may say, was published previous to my own, in 1912; the author had not reproduced the disease experimentally. In studying the literature on the subject of the effects of tick bites, I find that cases of paralysis have been seen in other countries, such as Africa and Australia; but I am unaware of any experiments having been done to prove that the tick is the offender. The authors of these articles have simply found ticks on the affected animals and have suspected them of producing the symptoms. During the year, I have gained additional proof of the occurrence and distribution of "Tick paralysis" in British Columbia. For those who are interested in this disease and wish to get further information, I would refer them to the articles which appeared in "Parasitology."

I desire to record my appreciation for the help given me by Mr. R. J. Armstrong, sheep farmer at Chopaka, near Keremeos, who placed animals at my disposal for experimentation.

OESTRUS OVIS (LINN).

On May 31, seven larvæ were collected from the frontal sinuses of a sheep. Five of these were placed in 80 to 90 per cent alcohol. Much to my surprise, the larvæ still exhibited movements after five and one-half hours' immersion. This is conclusive evidence that alcohol has very little effect on these larvæ.

In a recent number of the Review of Applied Entomology, there is an abstract of an article by Reid. The writer mentions the fact that two larvæ were taken from the nasal cavities of a sheep. Of these one lived for four days in a 2 per cent solution of formalin. Some years ago I tried the effect of formalin upon the larvæ of the house fly, and found that it had very slow killing properties; on the other hand, alcohol seemed to act very rapidly. Therefore, it would appear that the penetrating properties of these liquids vary greatly with different larvæ; and that the larva of *Oestrus ovis* is very resistant to alcohol and formalin. This makes one realize the futility of attempting to remove these parasites by injecting liquids into the nostrils.

From what I have seen, a large number of sheep along the Fraser valley are parasitized by these grubs, a fact which can easily be verified by inspecting the flocks during the spring, when many of the animals will be found to be suffering from catarrh. The only remedial measure which seems likely to give satisfaction would be to provide the sheep with a darkened shed in which they could take refuge during the hot days when the flies are most numerous.

WARBLE FLIES (ADDITIONAL NOTES).

PROTOCOLS OF EXPERIMENT.

The calf used for the experiment was born on September 28, thus excluding the chance of having been attacked by warble flies.

Calf "A."

On December 1, twelve larvæ were extracted from the gullets of two steers. These were carefully removed so as to avoid injury. As each was extracted, it was placed between two folds of the gullet and kept in a warm place. The removal of the larvæ took about half an hour.

An incision was made in the right hind quarter of this calf, and the larvæ were dropped one by one into the pocket. The wound healed rapidly, and no traces of the larvæ were seen until February 2, when four warbles were discovered on the animal's back. All except one were on the right side. Two of these became absorbed later and two remained until after March 10, when they also gradually became absorbed.

Calf 'B.'

On January 25, twenty-six second-stage larvæ were secured as in the preceding experiment, from four different gullets. They were placed in a pocket on the left hind-quarter of a November calf. On February 2 several warbles could be felt on this animal's back. One of them was squeezed out to make sure. Later, eleven of them pierced the skin all along the left side of the back. However, these died subsequently one by one and were absorbed; on March 10 only the punctures which they had made were visible, and all swelling had subsided. (Figs. I and II.)

The object of these experiments was mainly to find out if the second-stage larva, taken from the œsophagus and thus interrupted in its life-cycle, was capable of completing it in another animal. Experiments have been conducted by Koorevaar, who introduced larvæ beneath the skin of dogs and rabbits, and found them fourteen days

later in various parts of the body, including the spinal canal and the walls of the gullet (quoted by Carpenter). Hence, Koorevaar concluded that the maggots reach the gullet, or spinal canal, after extensive wanderings through the tissues of the ox or calf, and that they do not travel to the gullet by way of the mouth. This theory appears to me to be the most likely, and the experiment with calf "A", given above, helps to support it. In this experiment the larvæ were not seen for a period of eight weeks, when four of them were noticed on the calf's back; and it is certain that they were, during this period, in some unknown part of the animal, possibly in the gullet (?).

In the case of calf 'B,' the larvæ were interrupted in their life-cycle at a later stage, and it may be that they were too far advanced to return to the gullet and not sufficiently mature to migrate to the back. For this reason they did not develop fully. It was noticeable, however, that in calf "A" two of the warbles were larger, and it looked for a time as though these larvæ would reach maturity.

In a recent article by Carpenter and Hewitt, the authors quote Glaser, who states that the newly-hatched larvæ he had under observation, died in one and one-half hours if left in dry air, but that within an hour after hatching they could be revived by transference to water, in which they would live for two days. He concluded, therefore, that they need moisture for their further development, and that they would obtain this in the gullet. Newly-hatched larvæ, placed by him in the shaved skin of an experimental calf, made no attempt to bore through. One young maggot, however, hatched from an egg laid on his trousers by a female *H. lineatum* in June,, bored through the skin of his own leg and disappeared in one and three-quarter hours, leaving a small round red spot visible externally. Four or five days later the larva could be felt through the skin, having grown to a length of 2·5 mm. Then it apparently worked its way upwards, for early in September swellings were apparent on the hip and abdomen, and at the end of that month a swelling at the lower end of the gullet was indicated by pain when swallowing. This moved quickly up the gullet, and, on October 2, Glaser had the satisfaction of extracting a warble maggot, 7·5 mm. long, from his own mouth.

"This involuntary experiment tends to show that a warble larva can bore through the skin of the leg and work its way into the gullet in the human subject, and that the insect might pursue the same course in the ox. As mentioned in the introduction to this paper, the experiments with muzzled calves tried during several years at Ballyhaise, show that animals, apparently unable to swallow either the eggs or the young larvæ of hypoderma, are at the most, but partially protected from infection. The strong mouth-hooks and piercer, and the well-developed spiny armature of the newly-hatched maggot, suggest that it could, perhaps, bore as readily through the skin as through the mucous coat of the gullet, and we may eventually find the former to be, after all, the usual mode of entrance."

The quotation just given supports my own ideas on the subject, that the newly-hatched larvæ penetrate the unbroken skin. I have already shown that the egg is laid on the legs of the animal and attached to the base of a hair, next the skin. This has been confirmed by Professor Carpenter. The parts where the eggs are deposited are not easy of access to a cow's tongue and the hair covers the egg completely. Glaser mentions the fact that moisture is necessary to keep the larvæ alive; there are many opportunities for a cow to wet her legs during a summer's day, such as the dew in the morning, or when drinking; and the skin and hair would remain moist for a considerable period. In Glaser's experiment, the larvæ were placed upon an area of shaven skin, but in Carpenter's abstract of his work, no mention is made about supplying moisture. Possibly the failure of the larvæ to bore into the shaven skin may be attributed to the lack of moisture. In any case an experiment such as Glaser describes places the parasites in somewhat abnormal surroundings.

Several reasons suggest themselves as to why the larvæ select the gullet in which to pass certain stages of their existence. The mucosa is only slightly vascular, and the reaction on the part of the animal against the parasites is inconsiderable. In other organs or tissues, one frequently sees examples of encysted parasites, but I have not yet found an encysted warble larva in the gullet. One reason for this may be that the larvæ are constantly moving, and this fact may also account for their ability to pass through other tissues in their final journey to the back. It is noteworthy that nearly all helminths select either the abdominal cavity and respiratory tract or the skin for their habitat; for instance *Gongylonema scutatum* is found in the walls of the gullet, strongyles in the lungs, bots in the stomach, etc. Possibly the presence of a freer supply of oxygen than could be obtained in the deep tissues may lead them to select these situations, though the food supply may also be an important factor in their choice.

The final position taken by the larvæ is in fibrous tissue, of somewhat the same nature as that found in the mucosa. The reaction of the body against them is manifested by œdematous swellings. Very probably this reaction would end in their destruction, since they have now taken up a fixed position. But shortly after reaching the back, they bore through the skin, and bacteria gain entrance to the cavity in which they lie. Hence, it is my idea that they are helped rather than hindered in maintaining their position. In other words, the tissues have now two foes to cope with instead of one. In summing up, I think the reader will agree that the above experiment lends support to the theory of the larva penetrating the unbroken skin and thus gaining entrance to the body. This theory awaits final proof, and I am recording these observations merely for the purpose of adding my quota to the evidence already gathered.

The next point of interest concerns the position taken by the larva under the hide. While studying the structure of warbles, I have noticed that the opening through the hide is oblique, and that the larva lies with its ventral surface upwards. The caudal end is bent and protrudes through the opening, and this gives one the impression, from an outside view, that it is placed perpendicularly beneath the hide, instead of horizontally as is actually the case. Probably this has already been noticed by other observers, but the point I wish to make is that in the horizontal position the effect of the skin movements is reduced to a minimum. (Figs. III. and IV.).

THE TIME TAKEN FOR THE EMERGENCE OF HYPODERMA LINEATUM FROM THE PUPA.

4 larvæ found in stable on 20-3-13, all emerged under sixteen days.
3 larvæ squeezed out on 21-3-13, emerged under fourteen days.
5 larvæ squeezed out on 21-3-13, all emerged under nineteen days.
1 larva found in stable on day of emergence, 22-3-12, hatched in thirteen days.

These larvæ were kept in an incubator with intermittent heat up to 32°C. This shows how the temperature will influence the early or late appearance of Warbleflies in the spring. A large number of larvæ were secured during the spring of 1913; nearly all were of *H. lineatum*, *H. boris* only appeared later on. It was thought that during the spring of 1914, *H. lineatum* would be plentiful, but the contrary has proved to be the case; most of the larvæ secured so far are of *H. boris*. Possibly the season may be responsible for this, as the early spring of 1913 was very wet. No specimens of *H. lineatum* were captured out of doors, but *H. boris* was caught at a later date.

WARBLES.

Fig. 3.—On the left-hand side of the picture an unopened Warble is seen; on the right, a Warble larva; the sac has been partially removed to show its position, which is horizontal to the skin.

Fig. 4.—The same as Fig. 3, except that the Warble on the left has been opened to show the position of the larva.

SESSIONAL PAPER No. 15b

FOLLICULAR MANGE IN A COW.

(*Demodex bovis, Stiles.*)

A large piece of skin was received from Dr. S. A. K. White, of the Provincial Department of Agriculture. He had removed this from a cow condemned for tuberculosis.

According to Neumann, Mr. W. Faxon in 1878 found skins affected with follicular mange in some shipments of hides coming from Illinois and Minnesota. The lesions found in the hides after tanning were extensive, and extended through the whole thickness of the skin. Patton says that Demodex bovis causes small tumors which become abscesses. The portion of the hide which I received here was also quite valueless for tanning purposes, the nodules were filled with a cheesy substance containing innumerable mites. However, the nodules showed no signs of turning into abscesses, which was proved by the hair having adapted itself to the shape of the tumor. This can be verified by examining figures. I am unaware of follicular mange in cattle having been recorded in Canada before.—Figs V and VI.

CYSTICERCI FOUND IN SHEEP'S HEARTS.

Several hearts were sent to me by Dr. E. A. Bruce, of Vancouver; these contained calcified cysticercus cysts. In one of them a newly-formed cyst was discovered, and it was thought that probably it was the larval form of *Cysticercus ovis.* The specimen was forwarded to Dr. B. H. Ransom, of the Bureau of Animal Industry at Washington, D.C., who was unable to give a positive opinion. This was owing to the fact that the parasite was damaged. Dr. Bruce is keeping a watch for other specimens, and in case these occur again, further examinations will be made.

QUANTITATIVE BACTERIAL TESTS OF MILK.

By G. H. Unwin, B.S.A.

Assistant Veterinary Research Laboratory, Agassiz, B.C.

During the months of February, March and April, 1914, a number of bacterial counts were made with the milk of the dairy herd. The object of these tests was two-fold:—

(1) To ascertain approximately the quantity of bacteria taken up by milk in the process of handling, from the cow to the consumer's bottle.

(2) To find the relation between the number of bacteria in the air of the barn at milking, and the number in the milk.

METHOD OF HANDLING MILK IN BARN AND DAIRY.

The cows are driven in from pasture or yard an hour or more before milking. The ensilage, grain, and roots are fed, and then some time is allowed to pass before milking is begun. All sweeping and hay-feeding is done afterwards. The men milk in white coats and overalls; and after milking each cow, the hands are washed at a tap and dried with a paper towel which is then thrown away. The udder is wiped with a damp cloth. It might be mentioned here that the cows are usually groomed after the morning milking during the winter months. Closed pails are used, and the milk, after being weighed, is poured into closed cans. It is then taken to the dairy, a distance of about 60 feet, cooled, strained and put into bottles. In the dairy all utensils are washed and scalded after using, and then left exposed to air and sunlight. It will be seen that the methods employed are simple, the object being to produce pure milk by means of care and cleanliness, without the use of an elaborate and expensive outfit.

(1) Comparative Tests of Milk from Udder, from Pail, and from Cooler.

METHOD OF QUANTITATIVE TESTING FOR BACTERIA.

Three samples were taken from each cow. The first was drawn from the teat, the second poured from the milk-pail, the third was run through the cooler, strained, and then dipped into the milk bottle. Sterile bottles were used in each case. The milk thus obtained was plated in the following manner:—

From the sample bottle, 1 c.c. of milk was taken with a sterile pipette, and allowed to drop into a bottle containing 200 c.c. of sterile water, where it was well mixed by shaking. Of this dilute mixture, 1 c.c. was drawn out and poured into the Petri dish. The Agar medium was cooled to about 40° C. and poured into the dish, the whole being then mixed and spread over the plate. The plates were then placed in the incubator at 37° C. and left for forty hours. This is a long incubation period, a fact which should be remembered in considering results. Two plates were used with each sample, to check results. It was found that the dilution used (200:1) was convenient, the colonies spreading out well and being easily counted.[1] The following table shows the results of the first series of tests.

TABLE "A".

Date.	No. of cow.	Milk from Teat.	Milk from Pail.	Milk from Cooler.
		Per c. c.	Per c. c.	Per c. c.
February 17	19	600	2,400	6,600
" 19	24	800	Spreading growth.	3,500
" 20	87	600	3,200	6,000
" 23	2	3,600	5,460	8,200
" 25	3	Sterile.	17,600	30,000
" 26	4	10,000	13,000	16,000
" 27	30	1,600	4,000	9,600
March 4	33	200	3,300	12,000
" 5	31	Sterile.	2,700	6,600
" 7	25	Sterile.	1,800	5,200
" 9	18	400	2,600	6,500
" 10	6	800	1,000	4,600
" 15	36	600	Spreading growth.	9,000
" 17	11	2,000	5,800	20,000
" 18	6	3,200	4,200	21,600
Average of counts		1,587	5,154	10,987

With regard to the first column of figures, it may be observed that, according to Ward (Pure Milk and the Public Health, 1909), the milk drawn directly from the udder is not often sterile. He places the minimum at two hundred and the maximum at nine hundred. Hastings, Hammer and Hoffman, Wisconsin, place the average of milk obtained in this way, at about one thousand per cubic centimetre. In testing the individual cows of the herd they find two apparently healthy cows which give an average count of 38,800 and 37,700 respectively. Comparing these figures with those given above, it will be seen that they coincide; and the findings may therefore be considered quite normal.

Five counts were discarded, it being clear in these cases that accidental contamination had occurred. Thus, on February 24, the milk of No. 29 showed 6,600 per cubic centimetre from the teat, and only 4,000 in each of the samples from pail and cooler. Again, on February 28, No. 13 showed 30,000 in the milk from the teat, and 20,000 in

[1] This is the method followed by W. H. Park, N.Y. (Jour. of Hygiene, July, 1901).

the milk from the pail. The first sample was obviously contaminated from some other source. Such counts as these, where an error was clearly indicated, were therefore discarded. The average of the fifteen counts tabulated gives:—

Milk taken directly from teat contained				1,587 per cc.
"	"	pail	"	5,154 "
"	"	cooler	"	10,987 "

Reducing this to a percentage we have the following facts indicated:

Process 1.—Milking.. .. .. 224 per cent increase.
Process 2.—Cooling and straining.. .. .. 113 " "

The value of these figures is relative. Quantitative tests of bacteria cannot be taken too literally. Yet it will be seen from the table given above that the results are quite uniform and are to be relied upon, as far as they go. They will in any case serve to emphasize the fact that each additional handling of milk greatly increases the risk of contamination, even where clean methods are followed; and consequently, that simplicity and quickness of handling are of prime importance in producing clean milk.

2. THE AIR AS A SOURCE OF CONTAMINATION OF MILK.

This series of tests was carried on during the month of April. The object, as stated above, was to find approximately the relation between the number of bacteria in the air of the barn and the number in the milk. The weather, for the most part, was sunny and dry, and, as would be expected, the counts were slightly higher than in February and March.

For the air test the method originally devised by Koch was followed. Agar plates were exposed to the air during milking. The period of exposure was three minutes; and the plates were placed upon a milking stool, which gave about the height of the milk pail. They were exposed as near to the cow and the milker as possible, in order to reproduce the conditions of milking.

With each air test a corresponding test was made of the milk of the whole herd: the sample was taken from the milk which had been cooled, strained and bottled for the consumer. Check tests were made in every case.

Following are the results in tabulated form:—

Date.	Time of Test.	Air Content. (Exposure 3 minutes.) Aver. of 2 plates.	Milk Content. (40 hrs. incubation.) No. per c. c.
April 4	5:10 p.m.	97 (108,86)	29,000
" 6	5:10 "	69 (78,60)	16,400
" 7	5:15 "	48 (45,51)	20,000
" 9	5:10 "	50 (49,51)	13,000
" 11	5:5 "	99 (94,104)	35,000
" 14	5:0 "	(1) 276 (311,241)	80,000
" 15	5:10 "	70 (76,64)	12,000
" 16	5:5 "	37 (36,38)	8,000
" 17	5:0 "	80 (78,81)	22,000
" 21	5-20 "	(2) 100 (97,104)	5,000
" 22	5:5 "	58 (51,65)	9,200
" 23	5:0 "	104 (107,101)	27,000
" 24	5:5 "	92 (88,96)	38,000

(1) On this date hay was being chopped in the barn above and the air was full of dust.

(2) The air plates were exposed after some of the heifers had been turned out. This may accounes for the high air count, as compared with the milk count.

From the figures it may be seen that the number of bacteria in the air of the barn appears to correspond to a great extent with the number in the milk. Particularly interesting is the test made on April 14, when an abnormal condition of the air existed. Dust-laden air is followed by a correspondingly dirty sample of milk. Excluding this abnormal case, the average of the counts shows:—

Air plate	75 colonies.
Milk plate	19550 per c.c.

Seven of the milk samples contained 20,000 or less per cubic centimeter; of these, six showed a corresponding air count of less than 75. The remaining six show over 20,000 in the milk; and all these have an air count of more than 75. Of the thirteen tests one shows a marked variation (April 24). Considering the numerous other sources of contamination which might cause variations, the results are sufficiently uniform to be convincing. The fact that air is a fertile source of milk contamination is, of course, ancient history. The figures taken from these tests are useful only in so far as they magnify the danger of such contamination.

The different organisms observed upon the air plates correspond to many of those found in the milk. Chromogenic forms, green and yellow, were present both in milk and air. A yellow Staphylococcus, similar to St. pyogenes aureus, was found in both plates. The yellow and white cocci mentioned by Hastings in Research Bulletin 6, Wisconsin Experiment Station, as being very frequently found in the milk of normal healthy cows, were abundant; and a spore-bearing bacillus, forming a spreading, arborescent growth, was common to both. This last corresponds in many respects to Bacillus mycoides lactis. Putrefactive, evil-smelling bacteria were found in air and milk.

CONCLUSIONS.

(1) That quickness and simplicity in methods of handling milk, reduce the risk of contamination.

(2) That air-borne organisms play a great part in milk contamination, and that especial care should be taken to have the air in barns as free from dust as possible.

APPENDIX No. 22.

PRELIMINARY NOTE ON THE EFFECTS OF FEEDING RICE MEAL TO PIGS.

(P. H. Moore, B.S.A , Superintendent Experimental Farm, Agassiz, B.C.)

In my annual report for the year ending March 31, 1913, some preliminary experiments were described on the value of rice meal as a food for swine.

This work was undertaken in response to numerous inquiries received from this section of the province concerning this food, it being evident that large quantities of rice meal were being sold to farmers. The work done was of a preliminary nature and was necessarily not conclusive; but it indicated that further careful experiment was both desirable and necessary in order to prove: firstly, whether this food was a profitable one for farmers to feed to pigs; and, secondly, what was its effect on animal nutrition.

With these two main objects in view, a number of experiments have been carried on for the past twelve months and the results seem to be sufficiently important to warrant the publishing of a preliminary note.

METHODS USED IN FEEDING.

This year eighty-eight pigs have been put through regular feeding trials, and fifty-two more are still in the pens at different stages of the feeding period. The feeding period lasts one hundred days; the pigs used were as nearly as possible of uniform size, age, and condition; and whenever inequality existed between two pens of pigs, the better animals were fed on rice meal. Each pen contained four pigs.

Rice meal was fed as the main grain ration, supplemented with skim-milk and green food. In most cases two control pens were kept; one of these was fed wheat shorts, the other mixed grain (ground peas, oats, and barley), the supplementary food being the same in quantity and quality as the rice meal pen. Rice meal was also fed in conjunction with other meals and mixtures of meals and controls were kept in every case. Some of the mixtures were as follows:—

Rice meal and shorts.
Rice meal and dried blood.
Rice meal and boiled potatoes.
Rice meal, alfalfa meal, and dried blood.
Rice meal and alfalfa meal.

Control pens on all of these mixtures were fed either wheat shorts or mixed grain. All the pens received equal amounts and quality of green food and a certain number of pens received dried blood in the place of milk. The pigs were kept in clean, dry, well bedded pens with a limited amount of exercise and plenty of fresh air and light; they were all fed three times a day, and were given clean water to drink when they desired it. Two or three times a week they were given liberal quantities of soil, ashes, charcoal and salt.

RESULTS OF FEEDING.

As an illustration of the results arrived at, the protocols of a certain number of pens are given in full:—

PEN "A."—RICE MEAL.

Weight at beginning of period	249	pounds.
Weight at end of period	544	"
Dressed weight at end of period	398.5	"
Total gain in live weight	295.	"
Average daily gain per pig	.737	"
Rice meal consumed for 100 pounds gain	376.9	"
Skim milk consumed for 100 pounds gain	338.98	"
Green food consumed for 100 pounds gain	338.98	"
Cost to produce 100 pounds gain	$6.05	

WEIGHT OF INTERNAL ORGANS.

Pig No.	Weight of Livers.	Weight of Heart and Lungs	Weight of Rest of Viscera.	Weight of Total Viscera
	Lb.	Lb.	Lb.	Lb.
1	3.2	2.5	24.5	30.2
2	1.5	1.2	10.8	13.5
3	2	2.8	14	18.8
4	1.7	1.6	8	11.3
Totals	8.4	8.1	57.3	73.8

NOTES.—Fifty-three days from the beginning, one pig became lame very suddenly, as if it had a cramp. It was very sore and squealed much; the skin of all the pigs was brown and unhealthy. A few days later, two other pigs went very lame, and another (No. 1) only slightly so. They all remained in this condition until the end of the trial; some days they were slightly better and other days they were very bad.

PEN "B."—WHEAT SHORTS.

Weight at beginning of period	322	pounds.
Weight at end of period	647	"
Dressed weight at end of period	472	"
Total gain in live weight	325	"
Average daily gain per pig	1.04	"
Shorts (wheat) consumed for 100 pounds gain	214.15	"
Skim milk consumed for 100 pounds gain	240	"
Green food consumed for 100 pounds gain	480	"
Cost to produce 100 pounds gain	$4.10	

WEIGHT OF INTERNAL ORGANS.

Pig No.	Weight of Livers.	Weight of Heart and Lungs.	Weight of Rest of Viscera	Weight of Total Viscera.
	Lb.	Lb.	Lb.	Lb.
1	3.3	1.9	11.7	16.9
2	3.3	2.1	12.3	17.7
3	3.4	2.1	16.1	21.6
4	2.6	2.1	15.9	20.6
Totals	12.6	8.2	56	76.8

NOTES.—All pigs remained healthy throughout the entire feeding period, and never missed a meal. The hair and skin was always in excellent condition. When dressed, the pork was firm and of excellent quality.

PEN "C."—RICE MEAL AND BOILED POTATOES.

Weight at beginning of period	237	pounds.
Weight at end of period	471	"
Dressed weight at end of period (2 best pigs)	180	"
Total gain in live weight	234.	"
Average daily gain per pig	.585	"
Rice meal consumed for 100 pounds gain	364.5	"
Boiled potatoes consumed for 100 pounds gain	337.6	"
Skim milk consumed for 100 pounds gain	427.3	"
Green food consumed for 100 pounds gain	427.3	"
Cost to produce 100 pounds gain	$6.75	

WEIGHT OF INTERNAL ORGANS.

Pig No.	Weight of Livers.	Weight of Heart and Lungs.	Weight of rest of Viscera.	Weight of Total Viscera.
	Lbs.	Lbs.	Lbs.	Lbs.
1	2·9	1·9	16·1	20·9
2	1·7	1·2	13·5	16·4
Totals	4·6	3·1	29·6	37·3

NOTES.—At the end of the period, two pigs were kept for veterinary examination, and, although weights of the viscera were obtained, they are not comparable with these or other figures, hence they are withheld. Thirty-four days after the beginning of the period, all of the pigs refused food and became very lame. Their skins were rough and dark-coloured. Pigs 2, 3, and 4 got very sore and noisy when disturbed; pig No. 1 had intermittent attacks. At times they took violent fits of cramps, characterized by much squealing. Only one pig could stand at the end of the period. Pig No. 3 died in 130 days from beginning of period.

PEN "D."—MIXED GRAIN.

Weight at beginning of period	248	pounds.
Weight at end of period	638	"
Dressed weight at end of period	476	"
Total gain in live weight	390.	"
Average daily gain per pig	1.09	"
Mixed grain consumed for 100 pounds gain	229.2	"
Skim milk consumed for 100 pounds gain	235.8	"
Green food consumed for 100 pounds gain	233.33	"
Cost to produce 100 pounds gain	$3.92	

WEIGHT OF INTERNAL ORGANS.

Pig No.	Weight of Livers.	Weight of Heart and Lungs.	Weight of rest of Viscera.	Weight of Total Viscera.
	Lbs.	Lbs.	Lbs.	Lbs.
1	3·	2·7	19·2	24·9
2	3·1	2·5	17·1	22·7
3	2·9	2·6	17·	22·5
4	3·	2·5	18·1	23·6
Totals	12	10·3	71·4	93·7

NOTES.—Pigs were all in excellent condition from beginning to end of trial: when butchered, they were smooth and clean, giving an excellent quality of pork.

The foregoing tables deal with the question of profit, when we come to that of nutrition, some particularly interesting facts are forthcoming. It was noticed that pigs getting rice meal, after a period of from thirty-eight to sixty days, began to stiffen up and lose appetite. The hair grew long and the skin became unhealthy looking.[1] The muscles became affected, which was indicated by great stiffness and pain. The animals squealed when touched or handled. They preferred to lie buried in the straw, and lost their activity.[2] None of the controls showed any of these symptoms; consequently the rice meal was undoubtedly the cause of the trouble, no disease of a like nature having appeared among the other pigs on the Experimental Farm. It is probable that this lack of nutrition in the pig is due either to some toxic quality in rice meal or else to the fact that some necessary element is wanting for complete bone formation. The exact chemical nature of this food is being determined by F. T. Shutt, Dominion Chemist, Central Experimental Farm, Ottawa, who is also analysing bones from healthy and from diseased pigs. Until further experiments have been done, it is impossible to say just which of these theories is correct.

At the expiration of the feeding period, the hogs were slaughtered and the weights and general condition carefully noted. It was observed that in all pigs fed on rice meal, the flesh was softer, and the fat did not set as well as in the controls. Also the animals were in every case narrower across the loin, and their skin was rough and hard.

"NOTES ON THE PATHOLOGY AND SYMPTOMS OF RICE-MEAL FED PIGS."

Dr. S. Hadwen, Pathologist, Veterinary Research Laboratory, Agassiz.

"In the majority of the rice-meal pigs examined no very pronounced lesions were discovered, owing to the fact that the hundred-day feeding period was too short for the lesions to develop fully. The duodenum and stomach were bile-stained, and showed a marked catarrhal condition. In two more advanced cases the condition had progressed further, and in one of these peptic ulcers were found. These lesions are usually indicative of malnutrition, which was further borne out by the fact that the bones could be cut with an ordinary knife. Even the shank-bones could be broken with ordinary strength, or severed with a knife.

"The symptoms bear a striking resemblance to the descriptions of beri-beri in man. It is well known that rice eating is a strong factor in the production of this disease. It can also be produced experimentally in chickens by feeding rice, when it is called *polyneuritis gallinarum*. Besides the lesions described above, other symptoms lend support to this resemblance. The pigs show dilation of the right heart, leading to distressed breathing and cardiac attacks, during which the eye-balls protrude in a peculiar manner.[3] There is a condition of the nerves leading to sudden painful lameness, generally of the hind-legs, which tends to become chronic. The pigs are extremely sensitive to the touch, and prefer to lie still rather than move about and feed. In the later stages of the malady they are a pitiful sight, though emaciation is not a marked symptom; this is probably because there is no fever during the whole course of the disease.

"Mr. Moore is continuing the work with pigs, and is also conducting some feeding experiments with fowls, with the object of confirming these results. The experiments of Funk, Vedder, and others have clearly proved that certain rice products will cause this affection in poultry. Further information concerning this important disease will be forthcoming later, as a number of pigs are still under experiment. All the pigs slaughtered were carefully examined and when found to be poorly nourished, were condemned."

[1] Plate 1, fig. 1.
[2] Plate 1, fig. 2.
[3] Plate 2, fig. 4.

SUMMARY.

From an economic point of view, the interests involved fully justify the expense and trouble which the investigation has entailed. All of the pens fed on rice meal as the main grain ration showed a higher cost to produce a hundred pounds of gain than did their controls.

The average cost of one hundred pounds of gain and the amount of meal used to produce one hundred pounds of gain from all the pens fed in the main experiment are as follows:—

Average cost to produce 100 pounds gain, all rice meal pens...$6 15
Average cost to produce 100 pounds gain, all wheat shorts pens. 4 40
Average cost to produce 100 pounds gain, all mixed grain pens. 4 62

The average amount of rice meal to produce one hundred pounds of gain is 363·31 pounds; the average amount of wheat shorts to produce one hundred pounds of gain is 261 pounds; and the average amount of mixed grain to produce one hundred pounds of gain is 281·65 pounds.

These figures show conclusively that rice meal is not as profitable a food for swine as wheat shorts or mixed grain, even when bought at a cheaper price per ton.

In the experiments where rice meal was combined with other foods, the same result was obtained, namely; in every case where rice meal was fed. the cost of production was higher and the gains correspondingly lower.

There appears to be, however, another even more serious argument against feeding rice meal. Troubles indicative of malnutrition have invariably followed its use, and, although this phase of the situation requires further study the results given here are none the less important, though they belong rather to the realm of veterinary examination. These troubles have been noticed by other feeders throughout the province, but have always been ascribed to different causes. Their importance, then, from a feeder's standpoint, must be obvious to all.

In conclusion, I wish to acknowledge the support and assistance of Mr. J. H. Grisdale, B. Agr., Director of Experimental Farms, and to thank the farmers throughout the province for their interest and help in the work.

APPENDIX No. 23.

(L. L. Cooke, Chief Car and Yard Inspector.)

OTTAWA, March 31, 1914.

SIR,—I beg to submit herewith my report for the year ending March 31, 1914.

My duties during the major portion of the period were confined to the various livestock markets, as well as to the railway and other stock yards, stables and stock cars used for the public accommodation of animals, either in transit or when offered for sale.

The progress in this work has been gradual, but sure, and at the present time it is somewhat difficult to find a railway or other stock yard which is not in a clean, comfortable and sanitary condition. The same is true of the stables owned by the railway and stock car companies at the principal shipping points and at every large public stable in which horses or other live stock are held for sale or shipment.

Particular attention has been paid to all the large feeding stables at the different distilleries where a great number of cattle are fed during the winter months. A marked improvement has been made with regard to all stock cars used for conveying live stock. They are cleansed and disinfected by the various railway companies, under the supervision of car inspectors at all the principal division points, and it is somewhat difficult to find a dirty stock car on any of the railway lines returning to the various branch lines to-day.

We have two inspectors at Montreal who have supervised the cleansing and disinfecting of 13,819 stock cars during the year, two inspectors at Toronto who have supervised the cleansing and disinfecting of 27,192 stock cars during the year, and one inspector at Niagara Falls who has supervised the cleansing and disinfecting of 9,797 stock cars.

Also, there have been 6,782 stock cars gone through under sealed manifest from one point in the United States to another point in the United States. There have been cleansed and disinfected at Bridgeburg, under Veterinary Inspector Philps' supervision, 5,114 stock cars, and 2,500 went through in bond, sealed and manifested on United States, according to Ministerial Order 33, Section 3. At St. John there have been cleansed and disinfected, under the supervision of the caretaker of the quarantine barn, 188 cars during the year. At Halifax there have been cleansed and disinfected, under the supervision of the veterinary inspector, 449 stock cars during the year.

I have personally supervised the cleansing and disinfecting of a great number of stock cars at Carleton Place, especially those conveying hogs from the western provinces to Hull and then transferring to Carleton Place to be cleansed and disinfected.

I have also kept in close touch with all the boundary points where stock cars are transferred from one railway to another and have enforced Ministerial Order 33, Section 3, which is that all stock cars, whether of Canadian origin or not, and whether empty or conveying merchandise other than live stock, entering Canada from the United States must, if not already showing evidence of having been so treated, be thoroughly cleansed and disinfected to the satisfaction of an inspector of this department, otherwise they will be returned to the United States.

I have paid a good deal of attention to the quarantine stations along the boundary to see that they were kept clean and in good sanitary condition and properly cleansed and disinfected at different times of the year.

I have also arranged with the Grand Trunk officials at Bridgeburg for the erection of a new cleansing and disinfecting yard, as the old one has, of recent years, been altogether inadequate. The new yard is large and built according to the specifications laid down by this department. It is 2,000 feet long by 200 feet wide, and has two tracks for cars, with a disinfecting track in the centre, and is supplied with water and all the best equipment. There is an 8-foot board fence, battened on the outside, surrounding the yard, and a barb wire on top to keep unauthorized persons out. Stock cars that arrive from Buffalo and other points are cleansed and disinfected in this yard, and the manure is stored there and not allowed to be removed for a period of three months.

There have also been small pens erected at Richmond, Waterloo, Bryson, Mitchell, and several other small places on the various railways. At the Union stock yards, Toronto, there have been 120 additional pens added throughout the year, reducing the larger pens to smaller ones to suit the trend of business. Brick pavements have been laid throughout the entire yard, alleyways and unloading pens, using 800,000 bricks.

This yard is worthy of special mention, as I consider it one of the best, if not the best, we have in Canada to-day. Its capacity is 7,000 cattle per day, 4,000 hogs and 4,000 sheep. There are 184 concrete cattle pens, covering 4 acres; 154 concrete sheep pens, covering 2 acres; 85 concrete hog pens, covering 2 acres; 406 frame cattle pens, covering 8½ acres; 27 G.T.R. unloading chutes, covering 1½ acres; 22 double C.P.R. chutes, covering 1 acre. The tie-up barn holds 240 head; testing barn, 40 head; and dehorning plant, 60 head per hour; stabling accommodation for horses, 158 head. The area of this stock yard is 30 acres.

The disinfecting yard belonging to the Michigan Central Railway, at Montrose, has undergone some minor repairs and is kept in splendid condition. The manure from stock cars is stored for a period of three months before being removed, to prevent any chance of spreading disease. This yard is also used for the cleansing and disinfecting of stock cars.

I have investigated several complaints that have been made by the Humane Society from time to time, but have never found any grounds for such. I have also spent some little time in enforcing the Meat and Canned Foods Act and the regulations made thereunder. Three inspectors are stationed at Windsor to enforce Ministerial Order No. 33, Section 5. Any cars containing hogs showing evidence of disease, and any cars which are dirty or which do not, in the opinion of the inspectors, meet in every way the requirements of the regulations of this department are immediately returned to the United States.

Under this section, 11,672 cars have been inspected and 63 returned to the United States by our inspectors. At Sarnia there have been inspected by the inspector 11,890 cars, and 106 which did not comply with Ministerial Order 33, Section 5, returned to Port Huron.

In conclusion, I would like to state that the different inspectors stationed at the divisional points where stock cars have been cleansed and disinfected have enforced Ministerial Order 37, and the officers in this division have had the co-operation of the different railways in this work.

I have the honour to be, sir,

Your obedient servant,

L. L. COOKE,
Chief Inspector Live Stock Cars and Yards.

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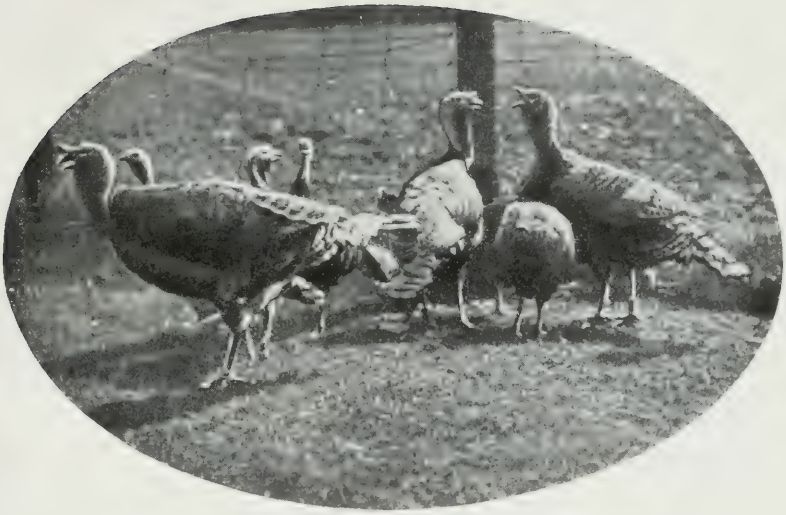

Fig. 1. A group of adult turkeys apparently healthy but in reality chronic carriers of the entero-hepatitis or black-head parasite. Such is the condition of the average flock in which the affection has appeared. Young poults allowed to run with these birds nearly all died of black-head, the usual experience.

Fig. 2. A flock of artificially incubated and brooded poults roaming in their isolated plot.

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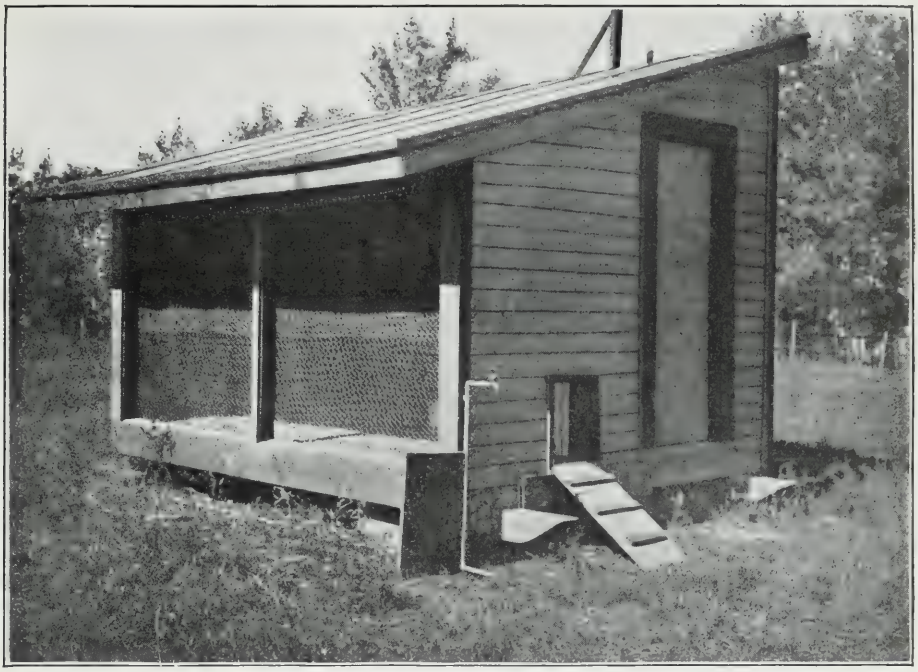

Fig. 1. Turkey shelter used for experimental work at the Biological Laboratory.

Fig. 2. Turkey shelter showing covered runway used for young poults at the Biological Laboratory.

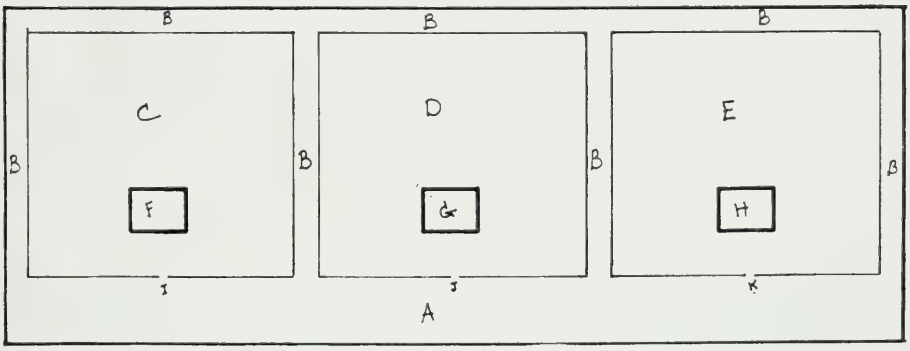

Diagram of the Experimental Turkey Plot at the Biological Laboratory.

"A" Laneway from which entry is secured to each individual plot.
"B" Dead line around the experimental plots to prevent the transmission of infection by contact.
"C" "D" "E" Individual plots. Approximately one acre each.
"F" "G" "H" Turkey Shelters. See Plate.
"I" "J" "K" Gates to enter plots from "A".

FIG. 1. Warble Flies.

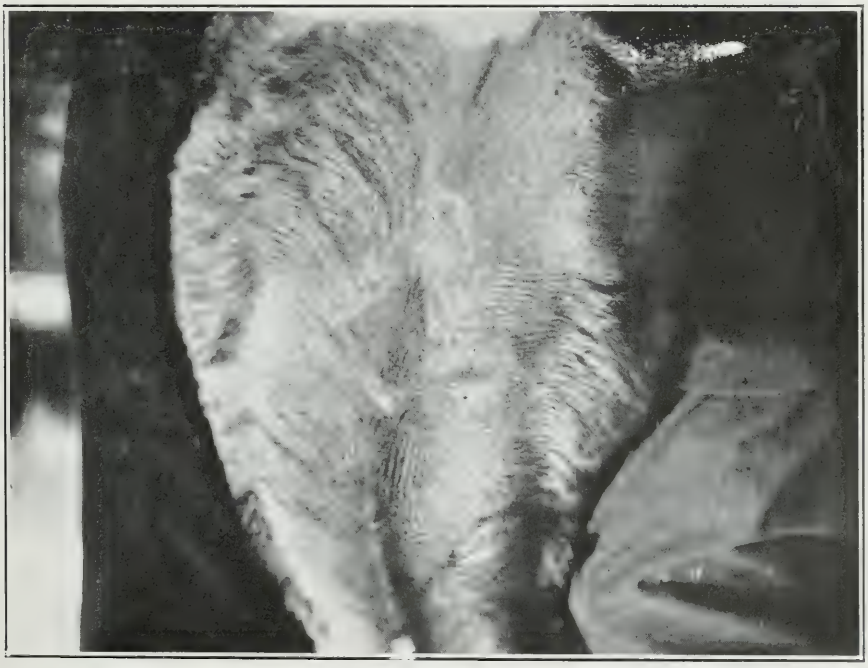

FIG. 2. Warble Flies.

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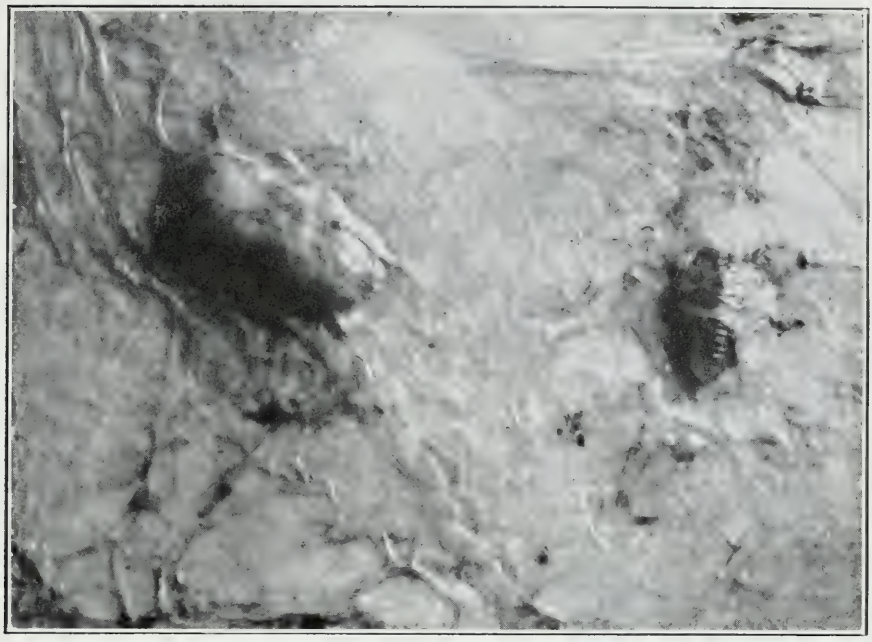


Fig. 3.

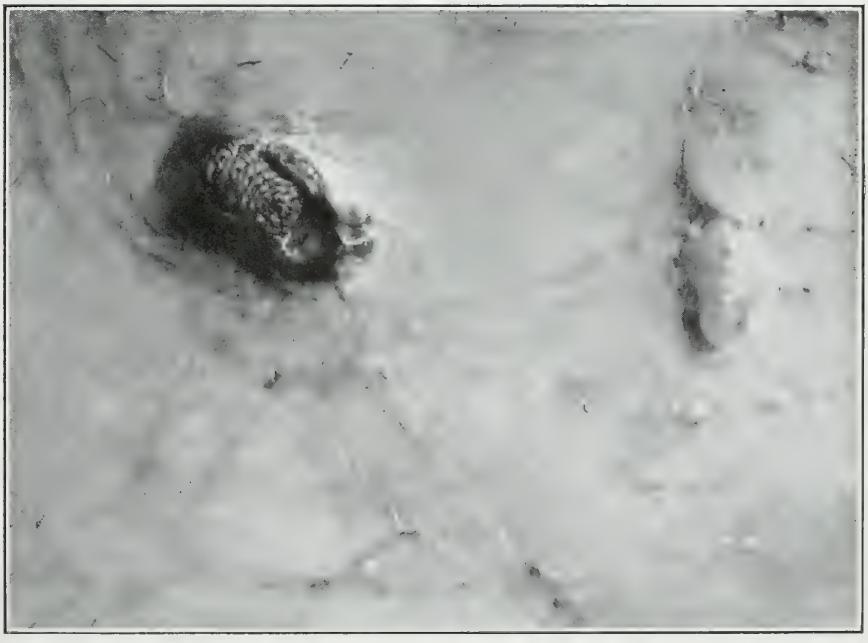


Fig. 4.

FIG. 5.
Piece of skin from cow showing the nodules caused by Demodox bovis (Stiles).

FIG. 6.
Enlargement of a portion of the skin illustrated in Fig. 5. The hairs have adapted themselves to the shape of the nodules. Photo. S. Hadwen.

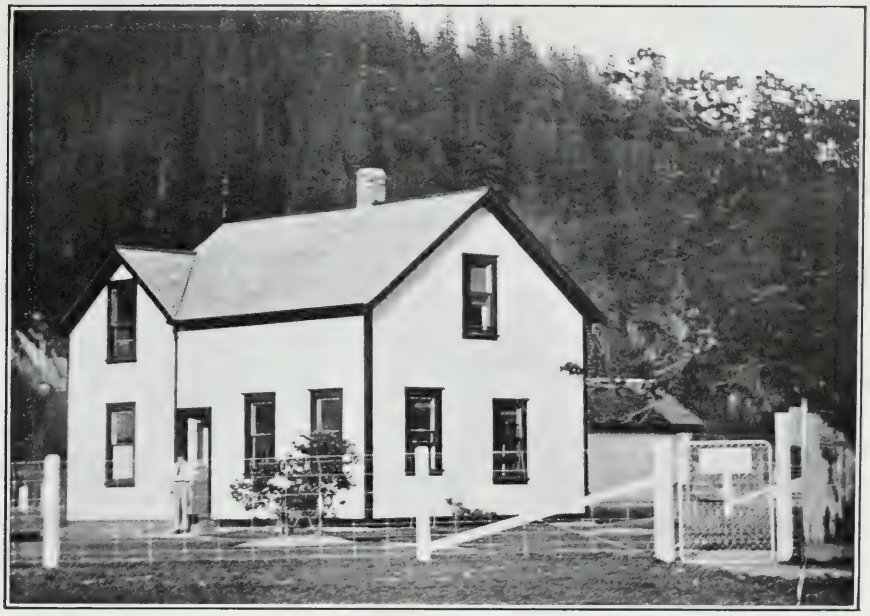


Fig. 7. Veterinary Research Laboratory, Agassiz, B.C.

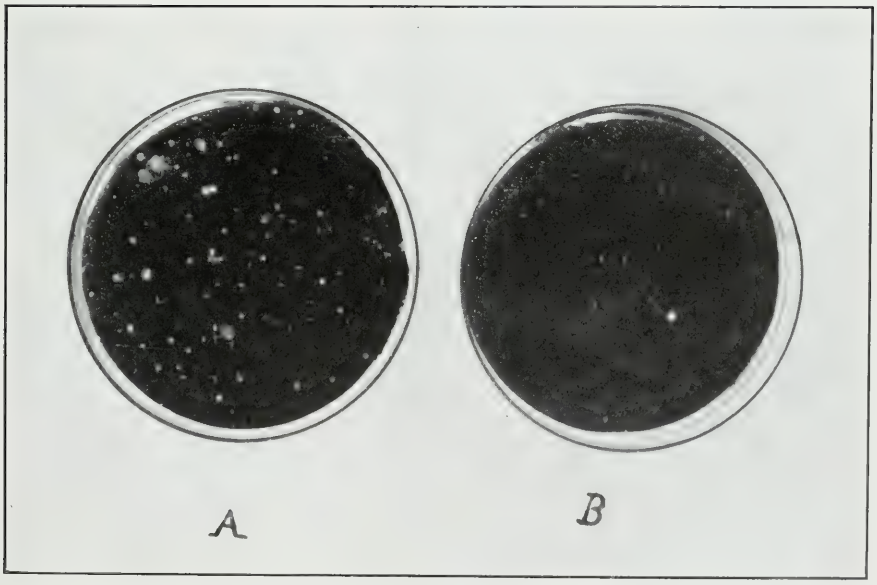
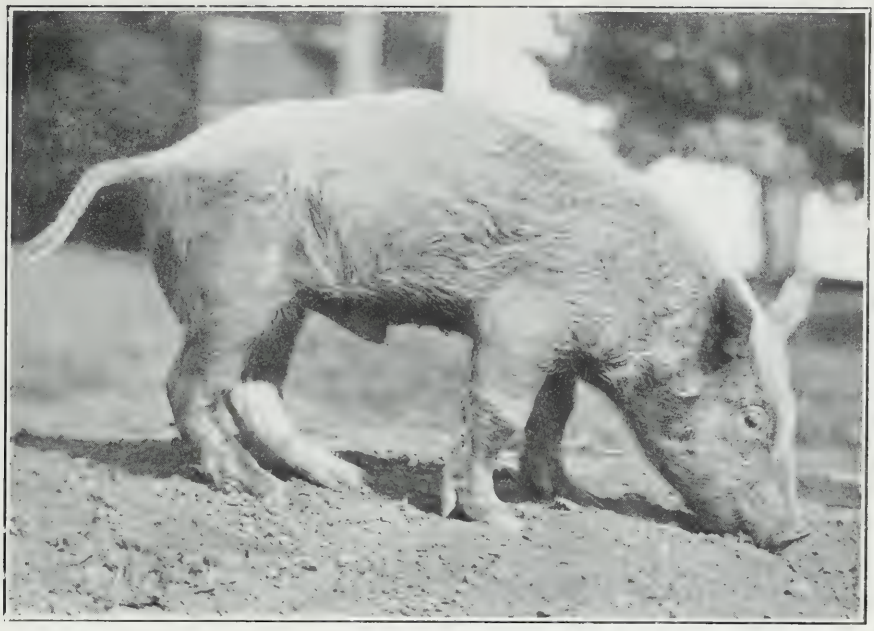


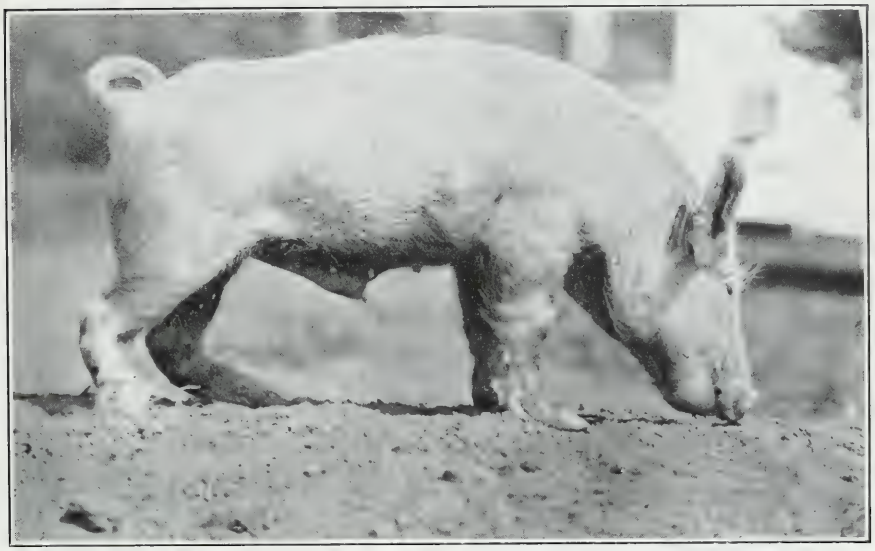
Fig. 8.

A. Air plate exposed on April 25rd. 107 colonies counted.
B. Milk plate exposed on same date. 135 colonies x 200=270,000 per c.c. The colonies in the milk plate, being submerged, developed less rapidly.



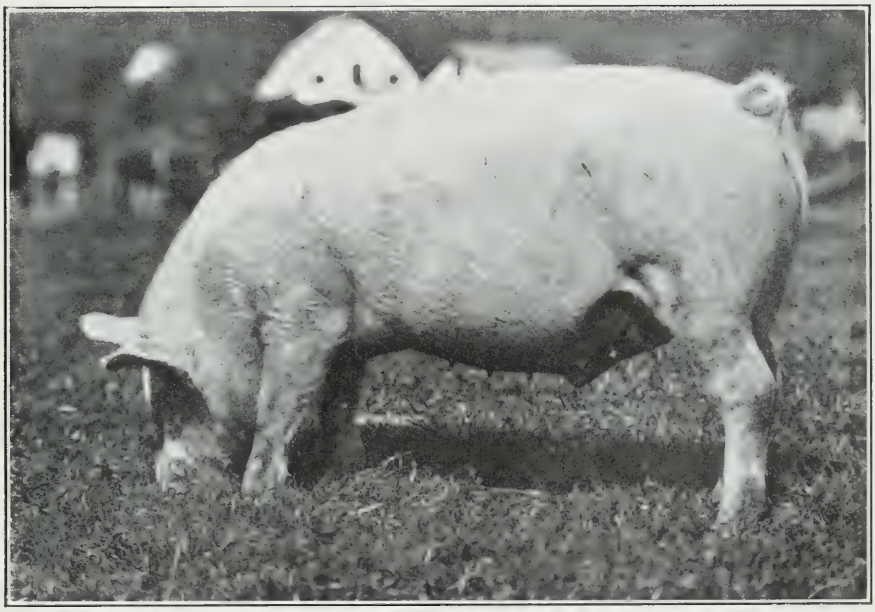
Typical case. Note length of hair. Rice meal feeding experiment.

This pig was subject to heart attacks. Kept fat but stunted in growth. On P.M. a well marked pericarditis was found and œdema of the lungs. Rice meal feeding experiment.



Rice meal feeding experiment.

At one time this pig could not walk at all, rice meal was stopped and shorts substituted. Now the animal can walk with difficulty. Rice meal feeding experiment.



Control pig same weight and age at beginning of experiment. Rice meal feeding experiment.

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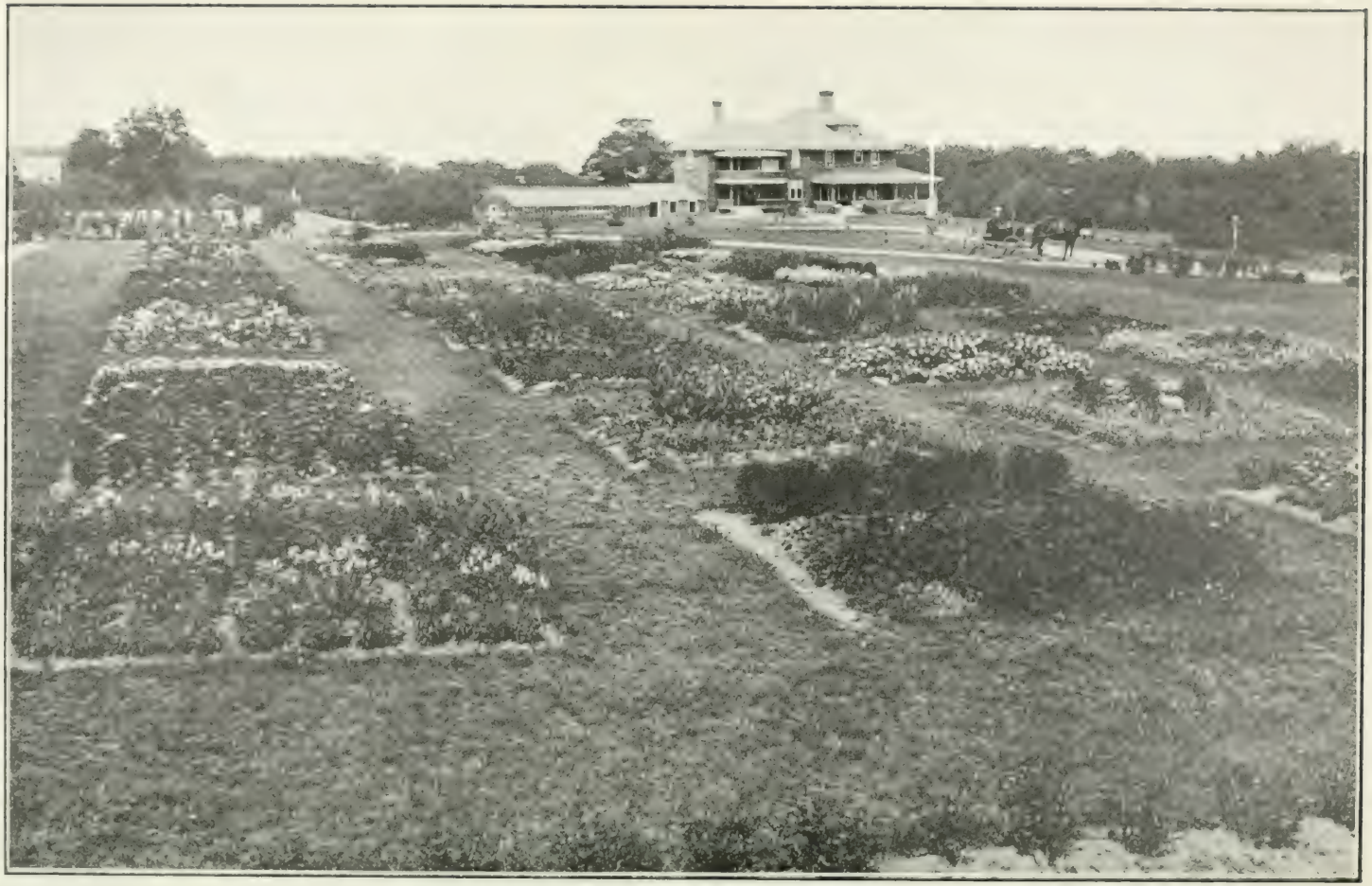

Flower Garden and Superintendent's House, Kentville, N.S.

APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS FROM THE

DIRECTOR
DIVISION OF CHEMISTRY
DIVISION OF FIELD HUSBANDRY
DIVISION OF ANIMAL HUSBANDRY

FOR THE YEAR ENDING MARCH 31, 1914.

PRINTED BY ORDER OF PARLIAMENT.

OTTAWA
PRINTED BY J. DE L. TACHÉ, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1915

[No. 16—1915]

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS

OTTAWA, March 31, 1914.

SIR,—I have the honour to submit herewith, for your approval, the twenty-seventh annual report of the work carried on at the several Dominion Experimental Farms and Stations.

Following the plan put into operation last year, the present report is divided into two sections, the first containing my report as Director and giving a summary of the year's results in the various Divisions on the Central Experimental Farm and on the branch Experimental Farms, Stations, and Substations. For the preparation of these Divisional and Branch Farm notes, I am indebted to the chief officers of the Divisions here and the Superintendents of the Branches.

Section B contains detailed reports on the various lines of experimental work under way throughout the Dominion Experimental Farms system during the year. These have been prepared by the Dominion officers having supervision of such work on the Central and branch Farms, in collaboration with the Superintendents of the latter.

These detailed reports fall under the heads of Animal Husbandry, Agrostology, Botany, Cereal Breeding and Variety Testing, Chemistry, Entomology, Field Husbandry, Horticulture (including Vegetable Gardening and Flowers), Poultry Husbandry, and Tobacco Husbandry.

Section A, which provides a concise, yet comprehensive, account of the work, is designed especially for those desirous of obtaining general information as to what is being done on the Experimental Farms system.

Section B is intended more immediately to aid the farmer in the various details of his work.

The favour with which this arrangement of the matter contained in the annual report has been received would seem to indicate that it presents the data of the year's operations in a much more acceptable and convenient form than that previously followed.

I have the honour to be, sir,
Your obedient servant,
J. H. GRISDALE,
Director, Dominion Experimental Farms.

To the Honourable
The Minister of Agriculture,
Ottawa.

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ANNUAL REPORT OF THE EXPERIMENTAL FARMS

FOR THE YEAR ENDING MARCH 31, 1914.

REPORT OF THE DIRECTOR

J. H. GRISDALE, B.Agr.

CROP RETURNS AND LIVE STOCK CONDITIONS IN 1913.

The following tables may prove of interest, as showing the average and total yields of the main field crops of the Dominion for the years 1912 and 1913, and the average yields and prices received therefor. In table II the average yields and prices for the above years are compared for the eastern provinces, the prairie provinces and British Columbia.

In table III, the numbers of the various classes of live stock are given for the five years 1909-1913, the Dominion being again divided for this purpose into the eastern, prairie and western sections.

A total estimated area under field crops of 35,375,000 acres produced returns valued at $552,771,500 as compared with 35,750,000 acres under field crops in 1912 with a total yield valued at $556,344,100.

The tables and other data given in this connection are compiled from figures given by the Census and Statistics Monthly, issued by the Department of Trade and Commerce.

TABLE I.—COMPARISON of Yields and Prices obtained for the years 1912 and 1913.

Crop.	Average Yield per acre.		Average Price per Bush.		Total Production.	
	1912	1913	1912	1913	1912	1913
	bush.	bush.	$	$		
Fall wheat	20·99	23·29	·84	·80	20,387,000	22,592,000
Spring wheat	20·32	20·81	·60	·66	203,772,000	209,125,000
All wheat	20·38	21·04	·62	·67	224,159,000	231,717,000
Oats	39·29	38·78	·32	·32	391,629,000	404,669,000
Barley	31·24	29·96	·45	·42	49,398,000	48,319,000
Rye	19·11	19·28	·72	·66	2,428,000	2,300,000
Peas	15·07	18·05	1·26	1·11	3,913,000	3,951,800
Beans	17·51	17·19	2·18	1·88	920,500	800,900
Buckwheat	26·38	21·99	·62	·64	10,517,000	8,372,000
Mixed grains	34·64	33·33	·58	·55	17,198,000	15,792,000
Flax	12·92	11·30	·90	·97	26,130,000	17,539,000
Corn for husking	56·84	60·30	·62	·64	16,949,700	16,772,600
Potatoes	175·38	165·88	·44	·49	84,885,000	78,544,000
Turnips, etc	403·71	358·30	·24	·28	80,016,000	66,788,000
	tons.	tons.	per ton.	per ton.	tons.	tons.
Hay and clover	1·46	1·33	11·09	11·48	12,117,000	10,859,000
Fodder corn	10·15	8·62	4·93	4·78	3,037,500	2,616,300
Sugar beets	10·63	8·71	5·00	6·12	201,000	148,000
Alfalfa	2·84	2·54	12·00	11·85	285,700	237,770

TABLE II.—COMPARISON of Eastern Canada, Prairie Provinces and British Columbia as to Yields and Prices Obtained.

CROP.	EASTERN PROVINCES.				PRAIRIE PROVINCES.				BRITISH COLUMBIA.			
	Aver. Yield per Acre.		Aver. Prices obtained.		Aver. Yield per Acre.		Aver. Prices obtained.		Aver. Yield per Acre.		Aver. Prices obtained.	
	1912	1913	1912	1913	1912	1913	1912	1913	1912	1913	1912	1913
	Bush.	Bush.	$	$	Bush	Bush	$	$	Bush.	Bush.	$	$
Fall wheat	20·63	23·91	·92	·85	21·87	21·67	·67	·67	33·00	33·14	1·03	1·01
Spring wheat	18·21	19·73	·98	1·07	20·96	21·12	·59	·65	30·33	26·67	·93	·99
Oats	32·56	32·87	·49	·45	44·90	41·92	·25	·26	56·00	55·50	·51	·58
Barley	27·97	27·95	·70	·67	32·95	30·79	·31	·32	45·33	35·25	·64	·68
Peas	18·81	22·04	1·54	1·60	23·83	17·25	1·14	·85	30·66	26·67	1·38	1·50
Rye	16·74	20·34	·84	·91	22·52	22·73	·57	·48				
Flax	13·18	17·11	1·62	1·39	12·75	10·98	·95	1·06				
Potatoes	192·12	180·47	·42	·47	217·63	176·66	·38	·41	233·15	207·30	·49	·66
Turnips, etc.	377·78	385·25	·27	·31	306·55	217·94	·46	·47	415·90	584·35	·53	·60
	Tons.											
Hay and clover	1·44	1·44	11·20	11·28	1·70	1·63	8·73	8·24	2·28	2·11	17·45	17·00
Sugar beets	11·16	9·23	5·00	5·20	7·00	5·00	5·00	5·00				
Fodder corn	7·99	8·97	4·75	4·03	3·73	6·26	9·27	8·50	8·00	7·66	9·00	12·00
Alfalfa	2·73	2·84	10·55	11·47	2·49	2·62	10·52	10·39	4·20	4·60	17·00	14·66

TABLE III.—Farm Live Stock, 1909-13.

	1909	1910	1911	1912	1913
Eastern Provinces—					
Horses	1,352,552	1,341,065	1,343,570	1,335,628	1,436,207
Milch Cows	2,441,306	2,426,280	2,076,056	2,079,188	2,188,824
Other cattle	2,748,691	2,577,867	2,509,622	2,410,671	2,479,406
Sheep	2,375,264	2,253,777	1,850,900	1,750,994	1,747,108
Swine	2,469,108	2,342,304	2,864,603	2,638,410	2,491,564
Western Provinces—					
Horses	779,937	872,134	1,194,927	1,296,994	1,369,283
Milch cows	407,999	417,671	484,170	491,289	516,011
Other cattle	1,636,088	1,673,096	1,324,405	1,315,681	1,336,098
Sheep	330,126	344,693	285,130	290,685	336,423
Swine	443,401	411,660	712,221	806,415	922,221
British Columbia—					
Horses			57,415	59,735	60,518
Milch cows			33,953	34,011	35,599
Other cattle			105,230	101,021	100,183
Sheep			39,272	40,702	45,000
Swine			33,604	32,485	34,541

NOTE.—Figures for 1909 and 1910 from British Columbia not available.

SESSIONAL PAPER No. 16

METEOROLOGICAL RECORDS AT OTTAWA.

TABLE of Meteorological Observations taken at the Central Experimental Farm, Ottawa, from April 1, 1913, to March 31, 1914, giving maximum, minimum and mean temperature for each month, with date of occurrence; also the rainfall, snowfall and total precipitation.

Month.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days Precipitation.		Date.
	°	°	°	°	°		°		In.	In.	In.		In.	
April	56·39	34·19	22·30	45·34	86·5	26th	21·0	20th	2·00	S.	2·00	10	0·78	4th.
May	64·96	42·52	22·43	53·73	89·0	4th	28·8	10th	2·39		2·39	9	0·76	28th.
June	77·77	50·67	27·09	64·21	93·2	27th	35·0	9th	0·82		0·82	10	0·25	26th.
July	82·61	57·50	25·11	70·05	100·	4th	44·8	12th	2·30		2·30	8	0·98	12th.
August	79·02	55·10	23·91	67·05	97·2	17th	38·0	25th	3·13		3·13	12	1·70	22nd.
September	67·77	45·90	21·87	56·83	88·0	2nd	30·0	15th	2·69		2·69	8	0·91	21st.
October	58·78	42·37	16·08	50·41	78·2	6th & 10th	22·0	31st	4·08	S.	4·08	14	1·02	2nd.
November	45·20	30·62	14·57	37·90	63·2	22nd	17·2	28th	2·48	2·00	2·68	12	0·92	19th
December	30·11	16·84	13·27	23·47	42·6	5th	— 5·0	27th & 28th	0·58	17·00	2·28	13	0·76	8th.
January	20·84	2·08	18·76	11·46	41·0	29th & 30th	−30·0	13th	0·64	30·50	3·68	17	0·90	21st.
February	16·89	−4·62	21·51	6·13	42·0	3rd	−30·2	11th		11·00	1·10	6	0·55	7th.
March	33·07	17·24	15·82	25·15	48·0	26th	— 2·0	12th & 20th	0·40	9·75	1·36	14	0·40	30th.
									21·51	70·25	28·51	133		

Rain or snow fell on 133 days during the 12 months.
Heaviest rainfall in 24 hours, 1·70 inches on August 22.
Heaviest snowfall in 24 hours, 9·00 inches on January 21.
The highest temperature during the 12 months was 100·0° on July 4.
The lowest temperature during the 12 months was −32·2° on February 11.
During the growing season rain fell 10 days in April, 9 days in May, 10 days in June, 8 days in July, 12 days in August, and 8 days in September.
February shows the lowest number of days with precipitation, viz., 6.
Total precipitation during the 12 months, 28·51 inches, as compared with 43·18 inches during 1912–13

RAINFALL, Snowfall and Total Precipitation from 1890 to 1913-14; also the average annual amount that has fallen.

Years.	Rainfall.	Snowfall.	Total. Precipitation.
1890	24·73	64·85	31·22
1891	30·19	73·50	37·54
1892	23·78	105·00	34·28
1893	31·79	72·50	39·04
1894	23·05	71·50	30·20
1895	27·01	87·50	35·76
1896	21·53	99·75	31·50
1897	24·18	89·00	33·08
1898	24·75	112·25	35·97
1899	33·86	77·25	41·63
1900	29·48	108·00	40·72
1901	29·21	97·25	38·91
1902	25·94	101·75	36·10
1903	26·43	85·00	34·92
1904	25·95	108·75	36·79
1905	23·71	87·25	32·42
1906 January 1 to March 31	1·90	24·50	4·34
1906-07	21·73	72·50	28·94
1907-08	24·70	134·75	38·18
1908-09	22·13	107·90	32·91
1909-10	28·40	61·25	34·51
1910-11	18·94	88·25	27·72
1911-12	20·12	98·50	29·95
1912-13	32·54	106·50	43·18
1913-14	21·51	70·25	28·51
Total for 24 years and 3 months	617·56	2,205·50	838·32
Average for 24 years	25·73	91·89	34·93

Record of Sunshine at the Central Experimental Farm, Ottawa, from April 1, 1913, to March 31, 1914.

Months.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
April	28	2	219·8	7·32
May	27	4	244·8	7·89
June	30	0	309·0	10·30
July	31	0	278·9	8·99
August	29	2	258·6	8·34
September	27	3	222·5	7·41
October	23	8	134·3	4·33
November	22	8	106·7	3·55
December	19	12	77·6	2·50
January	19	12	98·6	3·18
February	28	0	188·0	6·71
March	23	8	150·3	4·84

WILLIAM T. ELLIS,
Observer.

SESSIONAL PAPER No. 16

PUBLICATIONS ISSUED DURING THE YEAR.

During the year ending March 31, 1914, the following publications have been issued or are in the press at its close:—

The Annual Report of the Dominion Experimental Farms for the year 1912-13.

In the Regular Series of bulletins:—

No. 73, Smut Diseases of Cultivated Plants, their Cause and Control, by the Dominion Botanist, Mr. H. T. Güssow. This bulletin treats of the smuts of barley, corn, oats, wheat, millet, and broom corn, suggests treatments to prevent the sowing of infected seed, methods of cleaning and disinfecting separators used in the threshing of smutty grain, etc., etc.

Nos. 74, 75, 76 and 77 give, in a summarized form, the results of the season's work in cereals, field husbandry, forage plants and horticulture, respectively. These bulletins were prepared by the officers in charge of those divisions of the work at the Central Farm, in collaboration with the Superintendents of the branch Farms and Stations.

It is planned to continue this series of crop bulletins year by year in the endeavour to place in the farmer's hands, in time to be of use to him in his next year's operations, the results of the season's work throughout the Experimental Farms system.

In the Second Series of bulletins, there were issued:—

No. 15, on Preparing Land for Grain Crops on the Prairies. This was compiled by myself from data furnished by the Superintendents of our western Farms and Stations. It is primarily intended to be an aid to the new settler, and special arrangements have been made to render it available to those taking up our western lands.

No. 16, How to tell the Age of Hens and Pigeons, by Mr. Victor Fortier, of the Poultry Division, explains the details of a system for the above purpose, discovered by the author, and practised by him for some years with success in his work of judging poultry at exhibitions.

No. 17, entitled Forest Insect Conditions in British Columbia: A preliminary Survey, by Mr. J. M. Swaine, M.Sc., B.S.A., Assistant Entomologist for Forest Insects, gives some results of the author's investigations into forest conditions and the depredations of forest insects in British Columbia. This work was undertaken at the request of the Provincial Government of that province, and will be continued during the coming year.

No. 18, on the Strawberry Root Weevil in British Columbia, was prepared by Mr. R. C. Treherne, B.S.A., Field Officer of the Division of Entomology. The author has been stationed in British Columbia for some time and has had an excellent opportunity of studying at first hand some of its injurious insects.

Of Circulars, two have been issued by the Division of Botany and one by the Division of Entomology.

No. 4, of the first-named Division, was prepared by the Dominion Botanist, Mr. H. T. Güssow, assisted by Mr. A. E. Kellett, artist in the Division of Entomology, and is entitled Potato Diseases transmitted by the use of Unsound Seed Potatoes. It was brought out as a poster in colours, giving finely executed illustrations of potatoes affected with the diseases treated of, and was designed especially for hanging up in public places, such as schools and post offices, throughout the country.

Circular No. 5, by Mr. J. W. Eastham, Assistant Dominion Botanist, treats of the Powdery Scab of Potatoes.

Circular No. 3 of the Division of Entomology, entitled the Chinch Bug in Ontario, gives the results of an examination of the infested areas in that province, carried on by Mr. H. F. Hudson, Field Officer in the above Division.

In addition to the above-mentioned publications, prepared in their entirety by the officers of the Experimental Farms system, they have contributed special articles to each issue of the *Agricultural Gazette*, the official organ of the Federal Department of Agriculture.

CORRESPONDENCE.

The totals of the letters received by, and sent out from, the various Divisions at the Central Experimental Farm and the branch Experimental Farms and Stations, are tabulated below. The figures given indicate a steady growth in the appreciation of the work of the Experimental Farms, on the part of the farming community.

The total given for reports and bulletins sent out covers only such special applications as are received at the Central Farm. The Experimental Farms mailing list and the greater number of special applicants are supplied from the Publications Branch, Department of Agriculture, Ottawa.

CENTRAL EXPERIMENTAL FARM.

Division.	Letters Received.	Letters Sent.
Director	19,959	12,546
Field Husbandry	2,000	1,754
Chemistry	3,013	3,025
Horticulture	6,426	6,747
Cereals	13,131	3,505
Botany	1,937	2,251
Entomology	6,384	7,814
Animal Husbandry	3,641	5,213
Agrostology	587	873
Poultry	5,405	6,174
*Tobacco	.....	.....
French Correspondence	6,261	3,746
Miscellaneous	15,545	5,190
Totals	84,289	58,838

*Figures not available.

REPORTS, BULLETINS, AND CIRCULARS.

Reports and Bulletins mailed	12,010
Circulars re Distribution Seed Grain	23,538

BRANCH FARMS AND STATIONS.

Farm or Station.	Letters Received.	Letters Sent.
Charlottetown	1,538	1,421
Fredericton	1,621	1,950
Nappan	1,958	1,634
Kentville	2,557	2,623
Ste. Anne de la Pocatière	684	521
Cap Rouge	2,318	2,793
Brandon	4,215	4,081
Indian Head	13,157	12,917
Rosthern	1,610	1,556
Scott	1,088	1,069
Lethbridge	4,282	3,972
Lacombe	4,877	4,487
Agassiz	4,040	4,069
Invermere	662	558
Sidney	1,248	936
Totals	45,855	44,587

The totals for the branch Farms and Stations are exclusive of reports, bulletins and circulars sent out.

By adding the totals for the Central and branch Farms, the total number of letters received at all points is seen to be 130,144, and of those sent out 103,425.

DISTRIBUTION OF SAMPLES.

The annual distribution of samples of seed grain and potatoes was carried on under similar regulations to those followed last year, all applications for grain samples being filled at Ottawa, as well as those for potatoes from Ontario and Quebec.

The details of the distribution made from Ottawa will be found in the report from the Division of Cereals. The total number of samples sent out from Ottawa was 9,238. In addition to these, there were distributed from the branch Experimental Farms and Stations the following numbers of samples of potatoes:—

Charlottetown	13
Fredericton	55
Nappan	345
Brandon	392
Indian Head	1,266
Rosthern	434
Scott	71
Lethbridge	1,891
Lacombe	627
Agassiz	314

making a total sent out from all farms, of 14,646 samples.

Other distributions of material, more limited in scope, or of a special character, were also made, such as that of tobacco seed, some 3,640 samples of which were sent out, of inoculated soil for the growth of alfalfa, chiefly sent out from the western Experimental Farms, as well as a distribution of sweet corn to applicants from Quebec, carried on from the Cap Rouge Station, and of tree seeds, etc., from the Prairie Farms.

BUILDINGS AND IMPROVEMENTS.

BUILDINGS.

Four new greenhouses were erected this year at the Central Farm, giving about 7,500 square feet of glass. Their construction was sufficiently advanced at the close of the year to permit of experimental work being begun.

In October last, the main barn at the Central Farm was destroyed by fire. The cattle were all saved, but the machinery and equipment, together with a large supply of feed, were lost. Work was commenced at once on the erection of a new building, it being necessary to provide shelter for the cattle as soon as possible. Fortunately, the autumn was a favourable one, and the two wings of the new barn were got ready for the stock before cold weather set in. Construction has been continued throughout the winter, and the building will be completed during the coming summer.

In the Poultry Division, there were built an experiment and feed house, a cockerel house and an experimental breeding house.

More detailed descriptions of the above buildings will be found in the reports of the Divisions of Horticulture, Poultry and Animal Husbandry, respectively.

ROADS.

The main roads through the Central Farm were treated with Tarvia during the past summer, with satisfactory results. The surface was first covered with broken stone, which was thoroughly compacted by a steam roller. Tarvia was then applied hot and more stone somewhat more finely crushed spread thereon and again rolled. After rolling the second layer of stone another light coating of Tarvia was applied and stone dust scattered thickly thereon. The road was then considered ready for use.

On the branch Farms and Stations, notably at Kentville, N.S., Ste. Anne de la Pocatière, Que., and Indian Head, Sask., extensive building operations were carried on. These will be treated of in greater detail in the notes of the work at the branches.

VISITORS TO THE FARM.

In addition to the numbers visiting the Farm either singly or in small groups, there were numerous organized excursions during the summer months.

In this connection, the Auditorium proved most useful in affording facilities for the preparation and serving of lunch, the giving of addresses, etc. Several congresses and conventions were held in the city during the year, and a visit to the Farm was, as a rule, made part of the programme.

In co-operation with the Ontario Department of Agriculture, a short course in judging was given the judges chosen for the fall fairs in the eastern part of the province.

ADDITIONS TO AND CHANGES IN THE STAFF.

Mr. M. B. Davis, B.S.A., Assistant to the Dominion Horticulturist, was appointed in December last.

He was born at Yarmouth, N.S., and received his public and high school training at the Yarmouth County Academy. He graduated from the Nova Scotia Agricultural College in 1910, and continued his studies at Macdonald College, from which institution he graduated in 1912.

During this period of training, he worked on several farms, including a year on the Government Farm at Truro, N.S., and a season under Professor Blair at Macdonald College.

After graduating, he returned to Nova Scotia as manager of the Sunnyside farm and orchards, and also had charge of the Demonstration Orchard work for the Annapolis valley, carried on by the Dominion Government. During this time he acted as secretary of the Bridgetown Fruit Co., Ltd., and of the United Fruit Companies of Nova Scotia, Ltd.

In his present position, he is chiefly engaged in pomological work.

Mr. A. J. Logsdail, B.S.A., Assistant to the Dominion Horticulturist, received his early education in England. Coming to Canada, he took his degree at the Ontario Agricultural College, after which, returning to the Old Country, he spent two years as apprentice with James G. Sweet, V.M.H., F.R.H.S., proprietor of one of the largest establishments under glass in Great Britain. The following eighteen months were passed as Student Gardener at the Royal Botanic Gardens, Kew, where he was attached to the Landscape, Decorative and Tropical Departments, and secured a certificate for courses taken in economic and systematic botany, physics and chemistry.

Returning to America, he took a postgraduate course in Plant Genetics at Cornell University, and then took a position under the Ontario Department of Agriculture as Assistant Horticulturist and Expert in Plant Genetics at the Horticultural Experiment Station, Jordan Harbour. For eight months he was Acting Director of the Station.

He left this post to take his present position, in which he has plant breeding for his special field of work.

Mr. W. Dreher, B.S.A., Assistant to the Dominion Horticulturist, devotes his attention principally to vegetable gardening.

Mr. Dreher, after spending two years in the Agricultural School of the Canton of Neufchatel, Switzerland, came to Canada, and took the four-year course at Macdonald College, graduating in 1912. In addition to his college training, he has had considerable practical experience in farming and market gardening.

He took his present position soon after graduation.

Mr. Walter L. Graham, B.S.A., Assistant to the Dominion Field Husbandman, was born at Britannia Bay, near Ottawa. He received his early training at the rural public school, the Ottawa Collegiate Institute and at his father's stock and dairy farm. He entered the Ontario Agricultural College in 1909, taking the agricultural option. Graduating in 1912, he returned home and continued farming in partnership with his brother until he took the position he now holds.

Mr. R. W. Nichols, F.C.S. (England), Assistant in Milling and Baking to the Dominion Cerealist, received his early education at the King Alfred's grammar school, Wantage, England. He then attended the City of Dublin Technical School, taking the complete seven-year course in science.

In 1901, he was appointed Assistant to F. Escombe, B. Sc, F.L.S., in the Guinness Research Laboratory, retaining the position during the three years the institution was maintained. He was then employed in the Scientific Department of the Guinness Brewery, Dublin, until 1911, being engaged in experimental work on the cultivation of barley and on the analysis of cereals, in connection with the Irish Department of Agriculture.

In 1912, he came to Canada and took a special course in milling and baking technology in Chicago the same year, after which he took his present position. His work consists in the testing of the milling and baking qualities of varieties of wheat and in testing for the public samples of bad and suspicious flour. He has also been conducting researches in breadmaking methods, and during the summer months does work on the experimental plots of the Cereal Division.

Mr. George Robertson, Assistant to the Dominion Poultry Husbandman, received his public and high school training in the city of Ottawa, and in 1894 went to the Ontario Agricultural College, where he spent two years, specializing in poultry culture in the second year.

After leaving college, he took up mixed farming at Galetta, Ont., paying special attention to poultry in its various branches. In 1904, he moved to the vicinity of Ottawa and took up poultry breeding exclusively, with most of the leading varieties of land and waterfowl.

During the latter period a considerable portion of his time has been occupied in judging, lecturing and editorial work, being widely and favourably known in all these lines.

He has been an executive officer of many of the Specialty Clubs and Poultry Associations and at the time of his appointment was serving his fifth term as President of the Eastern Ontario Poultry Association.

Mr. A. E. Kellett, Artist in the Division of Entomology, was born at Keswick, Cumberland county, England.

After receiving his public school education, he studied at Armstrong University, Newcastle-on-Tyne, and served five years' apprenticeship to process engraving and illustrating.

In 1910, he came to Canada and spent three years in Winnipeg with the leading engraving houses, as artist and designer. He was appointed to his present position in August, 1913.

Mr. W. W. Baird, B.S.A., Superintendent of the Experimental Farm, Nappan, N.S., is a native of Nova Scotia, and received his public and high school training in that province. In 1907, he entered Macdonald College, taking the four-year course and specializing in Animal Husbandry.

During his college course he gained considerable practical experience, being engaged during the summer in the Horticultural and Animal Husbandry Departments at the College, and also with the Agricultural Survey of the Province of Quebec by the Commission of Conservation, and judging field crops for the Seed Branch of the Dominion Department of Agriculture.

After graduation in 1912, he took the position of manager of a large estate in the Maritime Provinces, remaining therein until appointed Superintendent of the Nappan Farm, upon the resignation of Mr. R. Robertson, former Superintendent.

Mr. Elzear Montreuil, B.S.A., Assistant to the Superintendent, Experimental Station, Cap Rouge, Que., was born at Ancienne Lorette, in that province.

After his early training in the country school, and practical experience gained on his father's farm, he entered the Quebec Seminary, from which he proceeded to Laval University, where he took his arts degree.

Studying for two and a half years at the Agricultural Institute at Oka, he took his degree of B.S.A., in 1912. He then accepted the post of lecturer for the Provincial Department of Agriculture, resigning to take his present position.

Mr. T. J. Harrison, B.S.A., Superintendent of the Experimental Farm at Indian Head, Sask., was born near Carman, Man., and received his early education there, working during the summer on the farm.

After leaving high school, he took a five-year course at the Manitoba Agricultural College, and on graduation was made Assistant to the Professor of Field Husbandry, and later on was made assistant professor of that department, which position he was filling at the time of appointment as Superintendent of the Indian Head Farm.

Mr. K. MacBean, B.S.A., Assistant to the Superintendent, Experimental Farm, Indian Head, Sask., was born in Islay, in the highlands of Scotland, where he received his public and high school training.

After five years spent in commercial life he came to Canada and having acquired some practical experience of our farming methods by working on farms in Ontario

and Quebec, he entered Macdonald College, specializing in Animal Husbandry in his final year. He graduated in 1913, and was appointed to the position he now holds, made vacant by the resignation of Mr. R. Whiteman.

Mr. Victor Matthews, B.S.A., Assistant to the Superintendent, Experimental Station, Lethbridge, Alta., was born in Newfoundland, where he received his early education and agricultural training, receiving an A A certificate from the St. Johns' Methodist College.

In 1908, he came to Canada and farmed in Ontario until the autumn of 1909, when he entered Macdonald College. He specialized in Animal Husbandry during his course there and, graduating in 1913, was soon after appointed to his present position.

Mr. G. E. Parham, Superintendent of the Experimental Station at Invermere, B.C., was born at Melton Farm, Gillingham, Dorset, England, and received his early agricultural training at his home, a large sheep and dairy farm.

He then took a four-years' course at Reading College, and received the diploma of agriculture, specializing in horticulture and dairying. He managed an experimental farm for the late Sir W. Palmer, M.P., in connection with the Reading College, and published in book form the results obtained. He was then appointed Agricultural Lecturer and Demonstrator to the Bucks County Council, resigning this position to take that of manager of the experimental farm and lecturer in agriculture at the Reading College. In 1908, he came to Canada and joined his brother in a fruit farm in the Okanagan valley, British Columbia, where he remained until appointed Superintendent of the Invermere Station.

Mr. Angus Mackay, Superintendent of the Experimental Farm at Indian Head, Sask., since its establishment in 1887, was this year made Inspector of Western Experimental Farms.

Mr. Mackay's long experience in Experimental Farm work, his familiarity with agricultural conditions in general in the west, and his recognized position as an authority on good farming make his appointment as Inspector an excellent one.

The worth of his work as Superintendent of the Experimental Farm at Indian Head in furthering the agricultural interests of the prairie provinces, and those of Saskatchewan more particularly, can scarcely be overestimated.

He undertook the task of managing the Indian Head Farm in 1887, when settlers on the prairies were few and correct cultural methods for the region undetermined, and hence the crop-producing value of the prairie lands very problematical. His faith in the country was perfect, and he has shown wonderful devotion to the tasks set him of working out methods of crop production suitable to local soil and climatic conditions, of testing for suitability and productiveness the infinite variety of cereals, legumes, forage crops, fruits, trees, etc., possible of cultivation in Saskatchewan. His judgment in these matters has been most excellent, and his courageous and concise advocacy of what experience has shown him to be right have combined to make his name and his opinions honoured and respected by farmer and town-dweller alike, throughout his adopted province and far afield.

The Experimental Farms system and the poultry interests of the Dominion at large, suffered a great loss in September last through the death of Mr. A. G. Gilbert, Poultry Manager at the Central Farm since its establishment in 1887 until the winter of 1912-13, when ill health compelled him to give up active work as head of the Poultry Division.

Mr. Gilbert was one of the pioneers in poultry improvement in Canada, having made it a study for years before entering the Government service, and his work has laid a firm foundation for future experiment along these lines.

In his capacity of poultry manager, his efforts were untiring in educating the Canadian farmer in profitable poultry keeping. His interest and work were directed to aid the farmer rather than the fancier and to establish poultry raising as a profitable part of our farm industries.

As a speaker, his services were in constant demand, and his practical advice, bright personality and Scotch humour won him a host of ready listeners and warm friends.

In his reports and bulletins on poultry matters he covered the whole ground of farm poultry management. His evidence, as given before committees of the Senate and House of Commons from time to time, has been printed and distributed in large editions. These, with his numerous articles in the agricultural press, have made his name familiar to poultrymen throughout the Dominion.

Outside of his official duties, his interests were varied. He was closely identified with church, society and philanthropic work, and all who had the good fortune to know him in any of his activities, will always remember his geniality, simplicity and helpfulness.

MEETINGS ATTENDED.

My duties as Director permit of my attending but few meetings to speak on agricultural or other subjects. I was able, however, to be present at certain of the more important agricultural meetings and functions during the year, among which might be mentioned more particularly the winter fairs for Ontario at Guelph and Ottawa, the Manitoba Winter Fair at Brandon, the opening of the Manitoba Agricultural College at Winnipeg, the Dry-Farming Congress at Tulsa, Oklahoma, U.S.A., where I had the honour to be one of the Canadian delegates and give two addresses, the one on "Live Stock for Dry-Farming Districts," and the other on "Some Experimental Work in Cultural Methods on the Dominion Experimental Farms in Dry-Farming Districts," the Eastern Ontario Dairymen's Convention, the Western Ontario Dairymen's Convention, the Quebec Dairymen's Convention, the Quebec Live Stock Association at Montreal, the Ontario Live Stock Association at Toronto, the Macdonald Agricultural College Commencement exercises at Ste. Anne de Bellevue, Que., as well as a considerable number of Farmers' Club meetings and annual meetings of agricultural associations of different kinds.

JOURNEYS MADE.

As usual, the various Experimental Farms and Stations constituting this system were visited by me during the year. In some cases, several visits were made. This was done where work under way or other circumstance seemed to require a visit for inspection or to decide on lines of action to be followed.

In addition to these journeys made in connection with the Experimental Farms, I made a number of other trips into various parts of Canada, the most notable of which was the journey made by Mr. G. H. Clark, Seed Commissioner, and myself, from North Bay to Winnipeg by way of the Northern Ontario railroad to Cochrane, and thence over the right-of-way of the Transcontinental to Transcona, near Winnipeg. The object of the trip was to obtain at first hand what information we could as to the agricultural value of the so-called "clay belt," said to extend from some 150 miles within the province of Quebec on the east to nearly Superior Junction on the west, and from New Liskeard or Haileybury on the south to near James or Hudson bay on the north.

We left Ottawa via Canadian Pacific on the night of Thursday, June 26. Next morning, we left North Bay on the Timiskaming and Northern Ontario. The first hundred miles or thereabouts traversed by this line of railway is most unpromising for agriculture. The ground is broken, hilly and rocky. Lumbering and mining were proceeding actively, the latter reaching its climax at Cobalt.

From Cobalt, we proceeded to New Liskeard at the northern end of lake Timiskaming, and next morning went over the most southerly part of the "clay belt" in

company with Mr. Galbraith, District Representative of the Provincial Department of Agriculture, who drove with us through the best parts of the local farming area. The soil is a heavy clay, apparently fertile, but rather difficult to handle. There were many signs of late spring frosts; in fact there had been 8 degrees of frost on June 23.

On the morning of the 28th, we took train again for farther north. The country passed through is well-suited for agriculture, but will, of course, require great expenditure for roads, clearing and draining before it can be expected to prove very profitable. The last two operations will apparently prove rather difficult.

About 50 miles north of New Liskeard, we crossed the divide, and after that the streams flow north into James bay. Some 30 miles short of Cochrane is Monteith, where the Provincial Government has a demonstration farm supervised by Mr. Galbraith, who had accompanied us. The soil here was quite similar to that farther south and, while crops were somewhat more backward than those at Ottawa, they were quite as promising.

Sunday was spent at Cochrane, where soil and crops appeared much the same as in the more southern portions visited. On Monday, after some local inspections, some 7 miles westward, we went by motor speeder along the railway eastward, crossing the Abitibi river and going almost to the northern extremity of Abitibi lake. The country is very uniform in appearance. The surface is slightly undulating. The higher parts are covered with strong growths of fir, spruce and poplar, the clay coming practically to the surface. The lower or really level parts are covered with from 6 inches to 2 feet of black muck or Sphagnum moss, with a fairly strong growth of spruce thereon, while the lowest parts are waterlogged and covered deep with muck and moss, forming what is called muskeg. This is the character of the country, we were informed, from 150 to 160 miles east of Cochrane, or for some miles into the province of Quebec.

On Tuesday we started from Cochrane westward, along the railway, crossing Frederick House river, Conception creek and Driftwood river. At Mattagami river, 31 miles from Cochrane, two townships have been ceded to an American company. This company agrees to bring in and locate on this land at least twenty-five settlers a year. The company gets all the wood but owns no land, and has cleared about 150 acres, built a large saw-mill and is building a large pulp mill on Poplar rapids.

From this point to Ground Hog river is 19 miles. The first 31 miles from Cochrane to Jacksonboro on the Mattagami was similar to east of Cochrane. The next 19 miles was hardly as good on the average.

From Ground Hog to Kapuskasing river, 20 miles, was again quite similar in character. The highest parts seldom or never rose over 10 feet above the grade level, while practically never did the grade level stand more than 6 or 8 feet above the lowest stretches.

From Kapuskasing to Echo lake is 9 miles, to Apazatika is 11 miles farther, to Crow creek is 10 miles farther still, and Missinaibi, the greatest river of them all, is 10 miles beyond. From Missinaibi to Hearst, 21 miles, completes the first stretch of 130 miles, west of Cochrane, Hearst being a divisional point.

From Kapuskasing to Hearst was over a most remarkably uniform stretch of country, drained by numerous rivers and small streams, well wooded and yet easily cleared. In fact, it is a region of great agricultural possibilities. Of the whole stretch from 20 miles east of Cochrane to Hearst, or 150 miles, one might safely say that from 20 to 25 per cent would be easily cleared, from 30 to 40 per cent fairly easily cleared, some burning of muck and some drainage being necessary, and from 20 to 25 per cent more possible of being cleared but, being a little more difficult of drainage, would come under cultivation later and so cost more. That is, probably 80 to 85 per cent of the country could be brought under the plough.

At Hearst, we were fortunate in meeting Mr Wilgar, District Engineer of the N.T.R., and obtained from him much information about the country and assistance in our journey.

The next morning, Wednesday, July 2, we started on the second lap of 125 miles to Grant, the second divisional point west of Cochrane. The country west of Hearst is like that east of it, drained by numerous streams flowing north. In the stretch from Hearst to English river, some 97 miles, the railway crosses the Kukabemakagami, White river, Skunk river, Negagami river, the Negagami branch, Bad river, the Pegachouan, Flint river and English river. From Hearst to the latter point is probably the best part of the clay belt. I should judge that from 25 to 30 per cent would be easily cleared, from 40 to 45 per cent would need no great effort to clear, and from 25 to 30 per cent more could be cleared, but would require more work to do so. It promises to be a splendid agricultural country. From English river to Grant, while still in the clay belt, is likely to be of but small value agriculturally, being as it is, rather low where level, with the higher parts rocky.

From Grant to Armstrong, the next divisional point, the country is of very small agricultural value if one may judge by what one sees along the right of way on the N.T.R., rocky rises, quaking muskegs, shallow black lakes, and sluggish rivers, with a very rare stretch of decent soil making up the district through which the railway runs, for a distance of about 130 miles between the above points. The road on this division crosses a number of rivers, some running south and some north. Of the latter, the most notable was the Kowkashagami, and of the former the Ombabika, Jack Fish, Seymour, Mud, Rapid creek and Whitesand may be mentioned.

We spent the night at Summit, some 30 miles from Armstrong.

From Summit to Armstrong the character of the country changes for several miles; barren sand dunes struggle for the mastery with stunted jack pine and dwarf poplar. This gradually changes near Armstrong, and spots of quite fertile soil show up both east and west of this divisional point.

From Armstrong to Superior Junction, the country is, for the most part, of small agricultural value. Lakes, rocks, rivers, muskegs, sand hills, gravelly knolls, with here and there small clay pockets make up the district as traversed by the N.T.R. It will no doubt, in time, be brought under agriculture, in part at least, as the good parts seem to be fertile and the climate appears to be favourable. It would, however, on the whole appear to be more suitable for a forest reserve or a park than for agricultural development. The same may be said of the country to the west of Superior Junction to Reddit, the first divisional point east out of Winnipeg on the N.T.R. From Graham to Redditt the country is exceedingly picturesque. Lakes are almost always in sight. It is the prettiest part of the whole N.T.R. From Reddit to Transcona some good country is traversed.

We reached Transcona at 2.30 a.m. Sunday and the next morning an automobile bus took us the rest of the way into Winnipeg.

Another trip taken was that to visit certain of the more important Experiment Stations and Agricultural Colleges in the central part of the United States. Among the institutions visited were Manhattan, Kansas, Agricultural College and Experiment Station; Ames, Iowa, Agricultural College and Experiment Station; Urbana, Ill., Experiment Station and Agricultural College, and Lansing, Mich., Agricultural College and Experiment Station.

In November, I attended the meeting of the Directors of Agricultural Colleges and Experiment Stations, held in Washington, D.C., U.S.A.

SESSIONAL PAPER No. 16

EXPERIMENTS AT FORT VERMILION, PEACE RIVER DISTRICT, ALBERTA.

ROBERT JONES, EXPERIMENTALIST.

In the spring of 1913, work on the land was possible about April 17, harrowing was commenced on the 19th and the first wheat was sown on the 21st. May weather was fine and warm, with frequent showers. The grain germinated and grew well, but was retarded later by the dry, hot weather of June and early July. After July 10, showers were frequent and growth remarkably rapid. All wheat headed out by July 6. Haying commenced on the 18th of that month. The first wheat was cut on August 2, and harvest was general by the 18th.

September was rainy, delaying harvesting and threshing.

Wheat yields throughout the Fort Vermilion district averaged about 21 bushels per acre, oats 50 bushels, and barley 45 bushels per acre.

On the Experimental Station, nine varieties of spring wheat were tested, the highest yield 59⅔ bushels per acre, being given by Bishop. Prelude wheat was the first to ripen, on August 2, yielding at the rate of 48 bushels per acre. The lowest yield was 39⅓ bushels per acre.

Five varieties of oats were tested with yields from 84 bushels 24 pounds to 42 bushels 12 pounds per acre.

Two varieties of two-row barley yielded 48 bushels 36 pounds and 30 bushels 20 pounds respectively, while of four varieties of six-row, the highest was obtained from Champion, 65 bushels per acre, and the lowest 60 bushels from Success.

One variety of peas tested, the Arthur, gave 42 bushels per acre.

New and, it is hoped, hardier varieties of alfalfa have been tried this year, those formerly under test having been winter-killed.

Canary grass gave a yield of 2 tons 513 pounds per acre. Timothy, tall fescue, western rye and awnless brome failed to grow well, owing to entering the previous winter in poor condition.

Most of the apple and plum trees made good growth, although none fruited this year. Raspberries and currants did well.

The ornamental trees and shrubs grew well, and the display of annuals was very fine.

The following sorts of vegetables were grown successfully this year. Asparagus, rhubarb, celery, onions, beets, carrots, squash, cucumbers, citrons, tomatoes, beans, lettuce, garden peas, cabbage, and cauliflower.

Five varieties of potatoes were grown: Rochester Rose, Gold Coin, Carman No. 1, Early Rose and Irish Cobbler. The first-named gave the highest yield, 404 bushels per acre, and the Irish Cobbler the lowest, 308½ bushels.

METEOROLOGICAL RECORDS.

The following records of temperatures, precipitation and sunshine were taken by Mr. Robert Jones, Experimentalist at Fort Vermilion, and arranged in tabular form by Mr. W. T. Ellis, Weather Observer at the Central Farm, who has also prepared tables comparing the Fort Vermilion records with those at Ottawa.

TABLE of Meteorological Observations taken at Fort Vermilion, Peace River District, Alberta, from April 1, 1913, to March 31, 1914, showing maximum, minimum and mean temperature, the highest and lowest for each month with date of occurrence; also rainfall, snowfall, and total precipitation.

Months.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days Precipitation.	Heaviest in 24 hours.	Date.
	°	°	°	°	°		°							
April	48·88	21·14	27·74	35·01	78·6	20th..	1·5	8th..	0·38	3·00	0·68	3	0·34	22nd.
May	59·72	31·55	28·16	45·63	74·0	26th..	14·5	7th..	0·91	..	0·91	5	0·45	9th.
June	73·13	33·54	34·59	55·83	88·5	4th..	26·0	2nd..	0·98	.....	0·98	3	0·86	14th.
July	74·56	43·55	31·00	59·05	84·0	23rd..	32·9	25th& 28th..	1·57	.....	1·57	7	0·64	13th.
August	72·07	44·93	27·14	58·50	84·8	6th..	28·2	30th..	1·81	....	1·81	4	1·00	31st.
September	53·75	31·89	21·86	42·82	69·0	27th..	23·9	11th..	3·08	..	3·08	9	1·07	1st.
October	38·73	19·10	19·62	28·91	69·6	2nd..	− 2·5	28th..	0·72	0·50	0·77	6	0·30	20th.
November	25·72	3·36	22·36	14·54	46·0	5th..	−19·5	22nd..	0·17	1·50	0·32	3	0·17	15th.
December	19·16	−4·38	23·55	7·39	65·0	4th..	−39·0	24th..	...	4·25	0·42	5	0·20	20th.
January	−1·58	−20·41	18·83	−11·00	12·5	14th..	−54·0	29th..	...	7·00	0·70	4	0·40	18th.
February	−2·07	−26·46	24·38	−14·17	16·2	25th..	−56·5	2nd..	...	4·75	0·47	3	0·30	27th.
March	23·70	−10·47	37·40	−8·13	40·0	10th..	−40·5	25th..	...	7·00	0·70	3	0·50	31st.
									9·62	28·00	12·41	55		

SESSIONAL PAPER No. 16

SOME Weather Observations taken at Central Experimental Farm, Ottawa, as compared with those taken at Fort Vermilion, Peace River District, Alberta.

APRIL.

	Mean Temperature.	Highest Temperature.	Lowest Temperature.	Total Precipitation.	Heaviest in 24 hours.	Total hours Sunshine.	Average Sunshine per day.
	°	°	°				
Ottawa	45·34	86·5	21·0	2·00	0·78	219·8	7·32
Fort Vermilion	35·01	78·0	1·5	0·68	0·34	206·3	6·87

MAY.

	°	°	°				
Ottawa	53·73	89·0	28·8	2·39	0·76	244·8	7·89
Fort Vermilion	45·63	74·0	14·5	0·91	0·45	242·1	7·80

JUNE.

	°	°	°				
Ottawa	64·21	93·2	35·0	0·82	0·25	309·0	10·30
Fort Vermilion	55·83	88·5	26·0	0·98	0·86	351·9	11·73

JULY.

	°	°	°				
Ottawa	70·05	100·0	44·8	2·30	0·98	278·9	8·99
Fort Vermilion	59·05	84·0	32·9	1·57	0·64	294·7	9·50

AUGUST.

	°	°	°				
Ottawa	67·05	97·2	38·0	3·13	1·70	258·6	8·34
Fort Vermilion	58·50	84·8	28·2	1·81	1·00	252·9	8·15

SEPTEMBER.

	°	°	°				
Ottawa	56·83	88·0	30·0	2·69	0·91	222·5	7·41
Fort Vermilion	42·82	69·0	23·9	3·08	1·07	142·7	4·75

OCTOBER.

	°	°	°				
Ottawa	50·41	78·2	22·0	4·08	1·02	134·3	4·33
Fort Vermilion	28·91	69·6	−2·5	0·77	0·30	89·9	2·90

SOME Weather Observatons taken at Experimental Farm, Ottawa.—*Continued*.

NOVEMBER.

	Mean Temperature.	Highest Temperature.	Lowest Temperature.	Total Precipitation.	Heaviest in 24 hours.	Total hours Sunshine.	Average Sunshine per day.
	°	°	°				
Ottawa	37·90	63·2	17·2	2·68	0·92	106·7	3·55
	°	°	°				
Fort Vermilion	14·54	46·0	−19·5	0·32	0·17	67·0	2·23

DECEMBER.

	°	°	°				
Ottawa	23·47	42·6	−5·0	2·28	0·76	77·6	2·50
	°	°	°				
Fort Vermilion	7·39	65·0	39·0	0·42	0·20	42·7	1·37

JANUARY.

	°	°	°				
Ottawa	11·46	41·0	−30·0	3·68	0·90	98·6	3·18
	°	°	°				
Fort Vermilion	−11·00	12·5	−54·0	0·70	0·40	71·7	2·31

FEBRUARY.

	°	°	°				
Ottawa	6·13	42·0	−30·2	1·10	0·55	188·0	6·71
	°	°	°				
Fort Vermilion	−14·17	16·2	−56·5	0·47	0·30	94·7	3·38

MARCH.

	°	°	°				
Ottawa	25·15	48·0	−2·0	1·36	0·40	150·3	4·84
	°	°	°				
Fort Vermilion	−8·13	40·0	−40·5	0·70	0·50	188·7	6·08

RECORD of Sunshine at Fort Vermilion, Peace River District, Alberta, from April 1, 1913, to March 31, 1914.

Month.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
April	26	4	206·3	6·87
May	30	1	242·1	7·80
June	29	1	351·9	11·73
July	28	3	294·7	9·50
August	26	5	252·9	8·15
September	19	11	142·7	4·75
October	24	7	89·9	2·90
November	18	12	67·0	2·23
December	17	14	42·7	1·37
January	15	16	71·7	2·31
February	19	9	94·7	3·38
March	27	4	188·7	6·08

WILLIAM T. ELLIS,
Observer.

EXPERIMENTS AT GROUARD, LESSER SLAVE LAKE, ALBERTA.

The work at this point was again carried on under the supervision of Brother Laurent, of the Indian Mission.

The growing season of 1913 was wet and the temperatures low. Only three hot days occurred, the highest temperature being 94 degrees.

In spite of this, grains grew well. Barley was ripe on August 10, Early Red Fife wheat and Banner oats on September 1.

Threshing was completed on October 9. The yields were as follows:—

Wheat: Early Fife, 23 bushels per acre; Preston, 22 bushels; Marquis, 18 bushels. The yield of the last two was reduced from their being on heavy clay soil.

Ligowo oats yielded 45 bushels per acre, and Banner 40 bushels. Odessa barley gave 35 bushels per acre, and Manchurian, 34 bushels per acre.

In horticulture, while the cool, wet season was injurious to some of the plants tested, the results as a whole were satisfactory.

The fall planting of garden seeds has been practised at Grouard for years, with success.

Onions, carrots and parsnips were sown in the fall of 1912. The seedlings came up soon after snow disappeared in the spring and kept in good condition, being undamaged by the late spring frosts and heavy winds.

Soon after the middle of June, vegetables started in hot-beds, were transplanted into the open. These comprised cabbage, cauliflower, tomatoes, celery and squash. The yields from all were satisfactory in quantity and quality.

Late in April and early in May, the following varieties were sown in the open: Carrots, table beets, beans, peas, turnips (table), lettuce, onions, table corn, radish, rhubarb. These all did well except onions, which were destroyed by the onion worm.

More than fifty varieties of flowers were grown successfully.

Currants and strawberries gave good yields.

EXPERIMENTS AT GRANDE PRAIRIE, ALBERTA.

Experimental work was continued by Mr. S. J. Webb at this point. The spring opened early, seeding commencing on April 12. The season as a whole was favourable, although wet, delaying haying and harvesting. On October 13, most of the grain was still in stook.

Potatoes and all kinds of vegetables were an excellent crop.

In cereals, Marquis and Preston wheats gave yields of 40 bushels and 35 bushels per acre, respectively. Banner and Thousand Dollar oats gave 70 bushels and 62 bushels per acre, and Arthur peas 45 bushels per acre.

Two varieties of mangels yielded 4 tons 1,100 pounds and 4 tons 800 pounds per acre, respectively, and two of turnips gave a return of 4 tons 1,200 pounds and 4 tons 700 pounds.

Alfalfa, Alsike, Mammoth Red and White Dutch clovers were sown with and without nurse crops, a good catch being obtained in each case. Equally good results were obtained with Red Top, Timothy and Orchard grass.

The following vegetables produced well: Peas, beets, carrots, lettuce, onions, beans and potatoes.

The display of flowers sown in the open was a very fine one.

EXPERIMENTS AT FORTS RESOLUTION AND PROVIDENCE, MACKENZIE DISTRICT.

Experiments were continued this year at the above points under the supervision of Father Duport, at Fort Resolution, and of Father Giroux at Fort Providence.

At Fort Resolution, seeding was completed about the middle of May under fairly favourable conditions, but dry weather following, much of the grain did not germinate. The latter half of May and all June were exceptionally cold. On June 25 there was a severe frost, the cabbage, peas and turnips suffering especially. In late July and early August, there was a good rainfall, but rather too late to have much effect on the yield of grain. The grain plots were attacked and destroyed just before the harvest by large flocks of small birds, which visit that region each year so that the yields could not be obtained.

Vegetables which survived the frost of June 25 did very well. Those grown included carrots, beets, peas, turnips, onions, cauliflower and cabbage.

As giving some indication of the shortness of the season, the following general notes may be of interest: Snow disappeared the third week in April; on May 19 the bay was still full of ice; it became clear on the 21st but was again blocked by ice coming in from the lake (Lesser Slave) on June 8. The first boat arrived on June 5, and the first steamboat on June 13.

On September 10 four inches of snow fell. Ice was formed along the shores of the bay on September 21 and, a month later, the ice on the bay would bear skaters.

The soil at the beginning of winter was full of moisture, which should give the 1914 crops a good start.

EXPERIMENT AT FORT PROVIDENCE.

The dryness of the season was most abnormal. No rain fell until June 10, and none after that during the remainder of the growing season. Even the native prairie hay was almost a total failure. There was a frost on July 8 which damaged the wheat considerably. Early in August the crows attacked the fields, destroying some of the varieties of cereals under test and damaging others.

Four varieties of wheat were tested: Bishop, Red Fife, Marquis and Preston. All matured on August 23.

Manchurian barley was ripe on August 19.

Five varieties of oats were grown: Banner, Gold Rain, Pioneer, Sixty Day and Thousand Dollar. The first four matured on August 10, and the last on August 23. Spring rye was ripe on September 4, and four varieties of peas, Arthur Selected, Golden Vine, Prussian Blue and White Marrowfat, on the same date.

The following vegetables were grown successfully: Lettuce, cabbage, beets, carrots and turnips. Tomatoes did not ripen, and table corn did not form ears.

The first fall frost occurred on September 5, and the ground froze for the winter on the 22nd. The ground has been covered with snow since the beginning of October.

EXPERIMENTS AT KAMLOOPS, B.C.

The possibilities of crop production in a region of sparse rainfall were again made the subject of experiment in 1913, on the Harper Ranch at Kamloops, under the supervision of Mr. L. F. Stobart.

The snowfall during the winter of 1912-13 was an average one, 18 inches falling in January. The weather throughout February was cold—17 degrees being the lowest registered.

Spring opened late, ploughing commencing on April 7. Fall wheat seemed to come through the winter well.

The fall wheat land was harrowed on April 16, and from then on a 'dust blanket' was kept on the surface to conserve moisture.

On April 28, barley was sown. The germination was good and, by preserving the soil mulch, and hence the moisture, through frequent cross-harrowings, a good crop was harvested.

The yield of wheat was very low.

The fruit plantation was kept cultivated throughout the season. The growth was very slow in most cases.

Ten pounds of each of the following varieties of potatoes were sown on May 15, and were harvested on September 25, with yields as stated: Clyde, 73 pounds; Table Talk, 73 pounds; Up-to-date, 61 pounds; Eureka, 60 pounds; Green Mountain, 90 pounds; Carman No. 1, 78 pounds; Early Hebron, 65 pounds.

EXPERIMENTS AT SALMON ARM, B.C.

Mr. Thomas A. Sharpe continued, during 1913, his experimental work for the department.

The cool, dry weather of spring, continuing until early June, delayed germination and early growth. June was also dry, though warmer. When rains finally came, the season was well advanced and vegetables could not recover. Fruit was also a light crop. Potatoes were very light.

Additional varieties of apples, plums and cherries were set out and made good growth.

The bush and tree fruits under test comprise a number of varieties of the following: Apples, pears, plums, damsons, cherries, grapes, strawberries, raspberries, loganberry, blackberries, red, white and black currants and gooseberries.

The meteorological data for the year were as follows:—

SALMON ARM.—Meteorological Record for 1913.

Month.	Highest Temperature.		Lowest Temperature.		Rainfall.	Snowfall.	Sunshine.
1913.	Date.	Degree.	Date.	Degree.	Inches.	Inches.	H. M.
April	11	74	1	19	0·52	...	290–4
May	31	80	3	24	1·26	...	220–36
June	7	88	13–16	40	2·27	...	237–12
July	20–24	92	8	44	1·83	.....	287–12
August	1–2–5	92	18–19–26	43	0·78	...	226–54
September	12–17	77	18	31	1·74	...	208–48
October	1	73	30	21	1·84	...	108–36
November	10	51	12–20	20	1·0	4½	49–06
December	7	44	22–24	14	...	7½	35–48
January	6	45	27	1	1·84	15½	30–48
February	27	−48	4	−5	0·40	10½	56–54
March	23	−56	25	12	0·89	1	121–48
Totals	...	...	...	...	14·37	39¼	1,874–42

THE DIVISION OF FIELD HUSBANDRY.

The operations of the Field Husbandry Division are very practical in nature. The scope of its work may be said to include:—

1. Soil management.
2. Crop management.
3. Agricultural engineering

In addition to the conduct of experimental work along the above lines it is the duty of this Division to supply grain and fodder for the up-keep of the live stock on the Farm. A very limited amount of land suitable for experimental tests is available, and for that reason those reported upon herein do not by any means cover the field of work that the Division naturally includes.

In this report the following lines of work are dealt with:—

WEATHER CONDITIONS AND CROP YIELDS.

For field crops, the season of 1913 was one of the worst in the history of the Farm. Clovers, as a rule, were badly winter and spring-killed, and the hay crop at the outset promised poorly. June and July were very dry. Hay made little growth, and in many cases was a failure. Corn suffered severely and yielded below the average. Straw was light, but the oats filled fairly well and harvested an average crop of grain. Mangels were greatly retarded at first, but made a good late-autumn growth and produced a medium crop.

COST OF PRODUCTION OF FIELD CROPS.

Because of the comparatively low yields in 1913, the cost of production per unit was high. The following table summarizes the costs of producing mangels, corn, oats and hay.

Cost of Production of Field Crops, Central Farm, 1913.

Crop.	Area.	Yield per Acre.		Cost to produce.		
		Tons.	Bushels.	Per acre.	Per ton.	Per bushel
	Acres.			$ cts.	$ cts.	Cents.
Mangels	2·00	17	584	36 35	2 14	6·22
Ensilage corn	18·00	12		22 03	1 84	
Oats	35·00		52	15 96		24·3
Oat straw		1·16				
Hay	33·5	2		11 78	5 89	

ROTATIONS OF CROPS.

The value of suitable rotations of crops is too often underestimated by our farmers. The results of our experiments in this connection would indicate that in the management of crops the order in which they are grown is of great importance. There are now in operation, for various purposes, fifteen rotations. For ordinary farm purposes any one of the following will likely be found satisfactory:—

Rotation 'A' (five years' duration).

Hoed crop, manured.—Grain, seeded down with clovers and grass. Clover hay, top dressed with manure in autumn. Timothy hay, field ploughed in August, top worked and ribbed up in October. Grain, seeded down with red clover to be ploughed under the following spring when the succeeding hoed crop is corn.

Rotation 'B' (five years' duration).

Hoed crop, manured.—Grain seeded down with clovers and grass, seeds top dressed with manure in autumn. Clover hay, ploughed in autumn. Grain seeded down with clovers and grass. Clover hay.

Soiling Crop Rotation 'R' (three years' duration).

Hoed crop, manured.—Grain, seeded down with clover and grass. Clover hay, timothy hay, field ploughed in August, top worked and ribbed up in October.

Soiling Crop Rotation 'R' (three years' duration).

Hoed crop, manured.—Grain, seeded down with clovers and grass. Clover hay.

Soiling Crop Rotation 'R' (three years' duration).

Corn for early fall feed, manured.—Peas and oats to cut green, seeded down with clovers and grass. Clover hay, to cut green.

Some characteristics of the above rotations, desirable under almost any conditions, are as follows:—

1. Grain fields are always seeded down with clover, even though it be used only as a fertilizer, as in the case of the fifth year of rotation 'A.'

2. Grass and clover seedings are heavy. Increased crops of hay and rare failures of a catch have justified them.

3. Hoed crops form a large proportion of every rotation. An attempt to farm a small area without a hoed crop was not successful. Weeds could not readily be kept in check.

4. No field is left in hay for more than two successive years. Our records show that the second crop almost always costs more per ton than the first, and that succeeding crops are very liable to be grown at a loss.

5. Barnyard manure is applied frequently in comparatively small quantities, rather than at long intervals in large quantities.

The following record shows the comparison of the chief items in connection with these rotations:—

COSTS, RETURNS AND NET PROFITS of Rotations "A," "B," "C," "D" and "R."

Rotation.	Cost to operate per acre.	Value of returns per acre.	Profit or loss per acre, 1913.	Profit, average of 8 years, 1904-11.
	$ cts.	$ cts.	$ cts.	$ cts.
A (Five years' duration)	17 55	19 40	1 85	8 78
B (Five years' duration)	21 83	21 47	−0 36	9 03
C (Four years' duration)	17 08	16 97	−0 11	8 15
D (Three years' duration)	19 35	17 80	−1 55	10 08
[1]R (Three years' duration)	19 14	19 50	0 36	...

[1] Records kept for 1912-13 only.

SHALLOW PLOUGHING AND SUBSOILING VERSUS DEEP PLOUGHING.

This experiment has now been under way for ten years. Two four-year rotations differing only in the above-mentioned autumn preparation for hoed crop of mangels and corn were laid down in 1904.

The average returns for the ten years show a very slight advantage in favour of the deep ploughing. If there is taken into consideration the fact that where subsoiling is practised a single plough must be used, whereas a two-furrow riding plough may be operated under the deep-ploughing method, the higher cost of operation in the former method would reduce the actual net profits still more. This experiment will be continued, as the results have not as yet shown any decided advantage in favour of either method.

COMMERCIAL FERTILIZERS AS A PART SUBSTITUTE FOR BARNYARD MANURE.

In 1913 there were completed five years of experiments designed to supply information concerning the relative fertilizing merits, in regular farm rotation of:—

1. No manure or fertilizer of any kind, but pastured one year in four (records kept in 1913 only).

2. Barnyard manure.

3. Complete commercial fertilizer.

4. Barnyard manure, together with commercial fertilizer.

The results show a distinct advantage in barnyard manure alone over commercial fertilizer alone for this soil, but point to the possibility of combining the two to good advantage when barnyard manure is scarce or high in price.

DIVISION OF CHEMISTRY.

The work carried on by the Division of Chemistry has been similar in character to that of past years, though in several of its branches there has been a widening of its scope and a very considerable increase in the amount accomplished. This has been rendered possible by additional chemical assistance and the better accommodation and facilities offered by the recent extension of the chemical building.

Research work upon the solution of problems affecting Canadian agriculture has first attention, but no less important is the educational and advisory work for the individual farmer. This latter has increased very considerably, both as to correspondence and the number of samples received for examination. It has from the first been the policy to encourage this phase of the work, and it is therefore gratifying to note that farmers throughout the Dominion are more and more realizing that the Division of Chemistry can be of real assistance to them in the difficulties that present themselves in their everyday work. As a bureau of information on subjects relating to the chemistry of agriculture, this Division is doing an important and valuable work, one which is appreciated and one which must make for the improvement of farming throughout the length and breadth of the land. This consulting work necessarily consumes a large amount of time, both in the office and in the laboratory, but it is believed to be time well spent in the country's interests.

SOILS.

The work on soils, in so far as complete chemical and physical examination is concerned, is chiefly confined to representative samples of the uncropped, unmanured soils from newly-settled districts in the Dominion and, naturally, the larger number of these have been sent in by the north-western provinces and British Columbia. The results have furnished sufficient data for a report on their general character and suitability for various crops, to indicate their deficiencies, if such have been noted, and the methods of culture, etc., whereby fertility may be maintained or increased.

In the case of cultivated soils sent in by farmers, complete analysis is not as a rule made, the character and extent of the examination being determined by the nature of the inquiry in the light of the information furnished respecting the past cropping and treatment of the soil.

Difficulties having arisen, it is alleged, in the successful cultivation of certain of the lands in the western section of the Canadian Pacific Railway Irrigation tract, east of Calgary, through rise of alkali and other causes, a number of soils carefully collected in this district have been under critical examination. This investigation is still in progress and will continue probably throughout the whole of next year. The results, it is hoped, will be of value in determining the suitability of these lands for cultivation under irrigation, and in outlining the means to be taken against injury from alkali, where such are deemed necessary.

The experiments in connection with the investigation on the conservation of soil moisture as influenced by cultural methods and cropping have been continued. The field operations are being conducted on several of the branch Farms and Stations in the northwestern provinces. This work was commenced three years ago and may be continued for another three years or more before a final report is made, but the results have already emphasized the value of early and deep ploughing before the rains are over, and of the preservation of an earth mulch and the destruction of weeds by harrowing as means for this conservation of moisture. The benefit of subsoil packing for this purpose has not been marked in all cases, though on the lighter soils it is undoubtedly of value. It is expected that this work will eventually permit of the outlining of systems of soil management suitable for lands in districts of sparse and irregular rainfall.

NATURALLY-OCCURRING FERTILIZERS AND AMENDMENTS.

A number of the more abundant seaweeds occurring on both the Pacific and Atlantic coasts have been analysed, thus adding to our knowledge of their relative manurial value. Very considerable differences in composition have been found, notably in potash and nitrogen.

Many soils are sour or unproductive through a deficiency of lime, and there is an awakened interest throughout Eastern Canada in the matter of liming as a means of increasing fertility. In this connection a number of marls and limestones —the latter to be applied to the soil in a finely ground condition—have been analysed and reported on.

FEEDING STUFFS.

The most important work in this connection has been the analysis of a series of products from the elevators, commonly classed as screenings, and consisting chiefly of various weed seeds. Concurrently with the analytical work, feeding experiments with poultry have been carried on, and these are still in progress.

FARM ROOTS.

The feeding value, as determined by chemical analysis, of many varieties of mangels, carrots and turnips, has been ascertained. This is a continuation of an investigation begun several years ago, and it is one that has yielded valuable results for the guidance of the stock raiser.

SUGAR BEETS.

As in past years, several of the more important of the factory varieties of sugar beets, as grown on the branch Farms and Stations, have been analysed. The data give ample proof that suitable beets for sugar extraction can be grown in many parts of the Dominion.

FERTILIZERS.

Experiments with commercial fertilizers have been carried on at Fredericton, N.B., and at Kentville, N.S. The crop employed at each Station was potatoes. The work was more or less of a preliminary character, but certain conclusions may be drawn therefrom which will be found of value to potato growers in these provinces. In this work the field operations were under the charge of the Superintendents of the respective Stations.

MEAT INSPECTION DIVISION.

The number of samples received for examination has very considerably increased during the past year. The materials analysed include the products of packing houses and canneries and the various chemical and other compounds employed in their manufacture.

WELL WATERS FROM FARM HOMESTEADS.

From the increasing number of samples sent in for analysis, one may judge that this useful work is awakening throughout our rural districts a keener interest in the wholesomeness of the farm water supply—an interest that must result in better health to the farmer's family and better thrift in his live stock.

HORTICULTURAL DIVISION.

During this year, perhaps the chief feature of interest in the Horticultural Division was the erection at Ottawa of the new greenhouses which had been badly needed. Four houses have been erected of the Pierson U-Bar, flat iron frame construction with curved eaves, and giving about 7,500 square feet of glass. Experiments were begun in these houses before the close of the year with tomatoes, cucumbers, melons, grapes, and many kinds of flowers, and it is expected that valuable experimental work will be done in the future.

The work of the Horticultural Division is subdivided under the heads of pomology, vegetable gardening, ornamental gardening, and plant breeding, and the office work as in the other Divisions. Space will allow for a few facts only in regard to each.

POMOLOGY.

Although the season was not a very favourable one for fruits, on the whole the apple crop at the Central Farm was fair. Owing to the manner in which the greater part of the orchard was originally laid out, by which only a few trees of each sort are grown, variety tests have been more prominent than cultural experiments in these orchards, but the amount of information gathered in regard to a large number of varieties has been very great and varied, and the Central Farm is looked to more and more each year for information in regard to apples. At the newer Farms, more attention is being given to cultural work. The outstanding features in the pomological work for 1913-14 were the appointment of an Assistant to the Dominion Horticulturist to devote most of his time to this work; and the promising character of some of the newer varieties of apples and strawberries originated at the Central Farm, such as Melba, Joyce, Thurso, Glenton, Rocket, Bingo, and Niobe among apples, and Cassandra, Cordelia, Desdemona, Ophelia and Portia among strawberries.

VEGETABLE GARDENING.

More attention is being paid each year to vegetable gardening in the Horticultural Division, and at the Central Farm a specialist is now in charge of this work. The same varieties are being tested at Ottawa as at practically all the branch Farms and Stations, and the average results from these tests should prove of great value to vegetable growers in different parts of Canada. The desirability of using home-grown seed where good strains are available, was particularly noticeable in 1913. The germination is usually better from home-grown seeds, and where earliness is important, as it is where vegetables are sold, the advantage of having seed that one can rely on is apparent. The Early Malcolm corn and Alacrity tomato, two varieties selected in the Horticultural Division, gave very satisfactory results.

ORNAMENTAL GARDENING.

At all the Experimental Farms and Stations, a strong effort is being made to make the grounds attractive, as there is great need for improvement in the surroundings of the rural homes of Canada. These demonstrations of what can be done under the various climatic conditions in the Dominion should be an inspiration to Canadians. In conjunction with the endeavour for pleasing effects is, of course, the experimental work with ornamental trees, shrubs and herbaceous plants, both as to varieties and methods of culture. One of the most striking things at most of the Farms in 1913 was the fine display of bulbs which, at the Prairie Farms especially, were much admired.

PLANT BREEDING.

Believing that there is a great opportunity in Canada for the development of fruits, vegetables and ornamental plants especially suited to Canadian conditions, more attention is being paid to plant breeding in the Horticultural Division. In 1913, breeding work was carried on with apples, pears, grapes, gooseberries, strawberries, corn, tomatoes, peas, beans and among flowers, with geraniums, sweet peas, and columbine. A specialty is being made of the development of early strains of vegetables, and some very promising ones were grown in 1913. Many new apples, originated in the Horticultural Division, fruited and descriptions were made of them, and some of the best named. Some good new plums of the Americana type were also described.

Work on the central card index system by which a record is kept of the experiments in horticulture and lists of varieties at all the Farms and Stations was continued during the past year and is proving a ready means of reference. A bulletin on Plum Culture was published during the year. Visits to the branch Farms and Stations were made as usual. A number of important meetings were attended and addresses given.

CEREAL DIVISION.

In spite of serious drawbacks in some sections of Canada the past season was, on the whole, unusually favourable for cereals.

In the Maritime Provinces, nearly all early-sown grain gave good results, and the crops were harvested without difficulty, but late-sown grain was badly damaged, and in some cases quite ruined, by a prolonged period of wet weather in the early autumn.

A large area in Quebec and Ontario suffered from drought during the greater part of the summer. The yield was materially lessened, especially on such fields as were sown late, but the quality of the grain was unusually good. It is doubtful whether such bright, hard kernels of spring wheat have ever before been obtained on the Central Experimental Farm and in the Ottawa valley generally.

While conditions varied somewhat in different parts of Central and Western Canada they were favourable on the whole, and the crops harvested were rather above the average in yield and quality.

NEW VARIETIES OF CEREALS.

The work with spring wheat is being given special attention by the Dominion Cerealist, who has a large number of new cross-bred varieties under observation. Many new varieties of oats, barley, peas, and flax are also being tested, but the study of most of these has not yet advanced far enough to warrant their introduction to the public. Great care has to be exercised to avoid the premature introduction of varieties which may prove disappointing when thoroughly tested. Attention may be called to three of the Dominion Cerealist's new early maturing sorts of spring wheat.

Prelude—This variety is in a class by itself. Its extraordinary earliness in ripening makes it extremely valuable for high latitudes or high altitudes where Marquis cannot be depended upon to ripen before there is danger of autumn frosts. Prelude generally ripens about two weeks before Marquis. It does not generally give a very large yield, and it is seriously affected by drought in May or June; but even with these limitations it is likely to be very valuable over large tracts of country, especially in northern Saskatchewan and northern and central Alberta.

Pioneer.—This is a new wheat introduced this winter for test in those districts where Marquis is too late in ripening and where there is not sufficient rainfall for Prelude. Pioneer ripens between Marquis and Prelude, and has shown superior ability to resist drought. The kernels of this wheat are red and very hard. It yields flour of excellent colour and strength.

Marquis.—This remarkable variety has again won the highest award in international competition. At Tulsa, Oklahoma, last autumn the first prize at the International Dry Farming Congress was won by an exhibit of this variety grown by Mr. Paul Gerlach, of Allan, Sask. This is the third international triumph in succession for Marquis wheat.

MILLING AND BAKING TESTS.

The appointment of a special assistant for milling and baking researches has made possible the enlargement of this branch of the work. Tests can now be made, as often as is necessary, of the new varieties of wheat which are being produced here, as well as those obtained from outside sources. Baking tests of flour of doubtful quality are also being made for the public whenever such samples are submitted.

DISTRIBUTION OF SAMPLES OF SEED GRAIN AND POTATOES.

The annual free distribution of samples of seed grain and potatoes has been conducted as usual, and is now drawing to a close. The total number of samples distributed this year will be over 9,200, about a thousand in excess of last year. The principal varieties sent out are Banner and Ligowo oats, Marquis and Prelude wheats, Manchurian barley, Arthur peas and Gold Coin potatoes. The great decrease in the number of applications for Red Fife during the last three years has been a very striking feature of the distribution. This year less than 200 samples of this variety are being sent out. The largest number of samples distributed this season to one province will be over 3,100 to Quebec. Ontario is receiving the next largest number, nearly 2,000.

DIVISION OF BOTANY.

The work of the Division of Botany includes two main groups, viz., Plant Pathology and Economic Botany. In addition, the Dominion Botanist has charge of the Botanic Gardens and that part in the administration of the Destructive Insect and Pest Act dealing with diseases of plants due to fungi and bacteria.

THE ADMINISTRATION OF THE DESTRUCTIVE INSECT AND PEST ACT.

As indicated in the last report, the efforts of the officers and inspectors appointed under this Act were mainly directed against the introduction or spread of malignant potato diseases. The discovery of Powdery Scab (*Spongospora subterranea*) in the eastern provinces of Canada, particularly in shipments made to the United States, prompted that country to place an embargo upon all Canadian potatoes. The Dominion Botanist is able to report that while powdery scab exists in the affected areas, it has not actually shown itself destructive. The infections are slight and the market

value of the tubers is but little impaired. The embargo placed upon Canadian potatoes alarmed the growers and shippers who claimed that it would be most difficult to find another market for the potato crop; their fears proved to be ungrounded, however, as the price of potatoes did not drop to any appreciable extent. Towards the end of the year of report, potatoes were almost scarce.

In order to instruct the farmers, the Division issued two new farmers' circulars: No. 4, entitled 'Potato Diseases transmitted by the use of Unsound Seed Potatoes,' a most useful representation of the most common potato diseases in natural colours, and with a brief and instructive text; and Circular No. 5 on 'Powdery Scab of Potatoes,' which publication briefly treats of this disease which was until recently unsuspected in the Dominion. These two circulars were most widely distributed and instructions by letter and public lectures have enabled this Division to reach many farmers. It is hoped that the persistent efforts to prevent potato diseases from being propagated by the careless use of unsound seed tubers will show good results. In fall and spring the inspection service was directed towards certifying seed potatoes to be free from disease. This will be followed by inspection of the fields and later of the crops, so that this disease should most quickly come under control.

PLANT PATHOLOGICAL WORK.

The work done in this section includes the advice by letter or demonstration on the control of plant diseases already known, and research on a large number of obscure diseases affecting specific vegetation of all kinds. The importance of clearing up diseases hitherto little understood must be fully realized. We only need refer to such obscure diseases as 'Little Peach' and 'Peach Yellows,' the last-named disease being most destructive in the Niagara peninsula, and about the cause of which absolutely nothing has been discovered since it was first reported in scientific literature. As the disease is at present unknown in the western peach orchards of Canada, this appears a sufficient reason for specializing in the investigation of one disease alone.

There are numerous problems of a physiological nature which have persistently defied solution. Of these 'Bitter Pit' of fruit is one of the most prominent, and is regarded as the most troublesome and economically important fruit disease. Then reference may be made to the perplexing phenomenon 'black heart' of fruit trees, which is viewed with suspicion by fruit growers, but for which belief, in our opinion, there is no real foundation. In some provinces this trouble is regarded with much concern and accurate information is greatly needed.

Furthermore, the relation of soil organisms to plant diseases is another prob'em urgently requiring attention.

Our experience with common potato scab would indicate that the organism either lives directly in the soil, or its growth is favoured by the chemical condition of the soil, brought about by the use of various manures or fertilizers. Thus the Dominion Botanist was able to prove that the organism of potato scab commonly referred to as *Oospora scabies*, really belonged to the group of most widely-distributed soil organisms of the genus *Actinomyces*. The biology of the soil is a study which increases in importance every year, and, if followed by special research, will no doubt lead to important discoveries in the control of many plant diseases which are carried in the soil. The discovery of relationship of the potato organism to the group of soil organisms of the genus *Actinomyces* opens up a further field of inquiry, viz., its relation to 'lump jaw' disease in cattle caused by another member of the same group (*Actinomyces bovis*). A number of diseases of the skin and hair of men and animals, like ringworm, favus, etc., may be more closely related to this group

of organisms than may appear from previous researches. This is one field of investigation entered into more recently by the laboratories of this Division.

Owing to the recent discovery of powdery scab in Canada and to the apparent difficulty of finding means of checking it, experiments have been undertaken and will be continued for such time as may be necessary to show whether control measures are possible or not.

Another disease hitherto recorded from Europe and the United States of America, known as Silver Scurf of potatoes has been observed during the year, an account of which will be found in the report of the Dominion Botanist.

The disease 'Silver Leaf' of fruit trees has engaged the attention of this Division; it has been ascertained that this disease may be produced at will by inoculation with a particular fungus (*Stereum purpureum*), but it has also been found that there are other agents producing the same symptoms. These must be investigated before one can be in a position to suggest methods for the control of the disease.

The St. Catharines laboratory of plant pathology is continuing its good work among the fruit farmers in the Niagara peninsula. Mr. McCubbin, the assistant in charge, by his careful work and by his desire to give advice and demonstrate methods of treatment, has gained the confidence of the fruit growers.

In the section for the eradication of weeds and the identification of plants poisonous to live stock, and other wild plants harmless or injurious, the assistant, Miss Faith Fyles, has a splendid opportunity to demonstrate to the farmer what plants to avoid and how to exterminate weeds.

The weed question is ever prominent. The routine necessary for their extermination often does not suit the practice of farming followed by some farmers; others permit little weed patches to become large and spread until their eradication is by no means easy. In most instances where advice is requested one feels that a little early attention might have saved considerable trouble. Of weeds it may be said correctly 'a stitch in time saves nine.' There is no better weed eradicator than a spade, and the sooner it is used the quicker will the weeds disappear. Ploughing up large patches of veined dock, Canada thistle, couch grass, etc., will only make them larger in the coming season.

The Dominion Botanist was absent on official business in the western provinces and towards the end of the fiscal year he was appointed to represent the Dominion of Canada at the first international phytopathological conference at Rome, Italy. While in Europe he was authorized to pursue certain investigations in connection with the utilization of any potatoes that may not be sold and heretofore were left to spoil. He is preparing a report on the question of evaporating potatoes for use as stock food at a time when fresh herbage is not available, and the possible introduction of the industry into Canada.

This is the age of specialization, and the work of the Division of Botany includes many phases in which special researches will become necessary, when the work done by the officers in this Division will become of still greater value because of its application to the special needs of all who require information and help along these lines of work.

THE DIVISION OF ENTOMOLOGY.

THE ADMINISTRATION OF THE DESTRUCTIVE INSECT AND PEST ACT.

This work includes the inspection and fumigation of imported nursery stock and the Brown-tail Moth control work. In order to facilitate the importation of trees and other plants into the western provinces, an additional port of entry was declared at North Portal, Sask., by Order in Council, and a fumigation station has been erected there. This will enable importers in Saskatchewan and Alberta to

secure their shipments without great delay, an essential condition for successful planting. As insuperable difficulties had been encountered in regard to the interception for the purposes of inspection and fumigation of shipments of nursery stock sent through the mails, the importation through the mails of those classes of nursery stock which required inspection or fumigation was prohibited by Order in Council, and the regulation came into effect on March 1. The entry of European nursery stock via the port of St. John, N.B., during the period December 8 to March 4, was also made possible by amending regulation 6. Owing to the repeated discovery of potatoes imported into British Columbia from California which were infested with the Potato Tuber Moth, one of the most serious insect pests affecting the potato, this insect was scheduled under section 12 of the regulations. Further, as a result of an inquiry made in California by the Dominion Entomologist, the importation of potatoes from California was prohibited.

In the addition to the new fumigration station at North Portal, Sask., new stations and additions to our accommodation for dealing with imported nursery stock have been erected at St. John, N.B., and Niagara Falls. During the importation season of 1912-13, which closed in May, 1913, over four million trees and plants were inspected.

The Brown-tail Moth control work includes the scouting work during the winter months, a study of the bionomics of the insect and the importation of parasites and their colonization during the summer. In New Brunswick the scouting work was carried on by a field force of nine men, four of whom were employed by the Provincial Government. The work for the season 1912-13 was concluded in February, and only eighty-one winter webs of the Brown-tail Moth, as compared with 2,452 in 1911-12, were collected in the seven counties at present infested. This decrease was largely due to the absence of any invasion of the moths from Maine during the flying season in July, 1912. In Nova Scotia a field force of nine men, four of whom were employed by the Provincial Government, collected over 11,000 winter webs, both the infested territory and the number of webs being greater than in the previous year.

The investigations on the bionomics of the Brown-tail Moth, particularly on the effect of temperature and the dropping of the webs during the winter, were continued with useful results.

The importation of the parasites of the Brown-tail and Gipsy Moths from Massachusetts was continued through the courteous co-operation of Dr. L. O. Howard, Chief of the Bureau of Entomology of the United States Department of Agriculture, and his assistants. An officer was stationed at the Gipsy Moth Parasite Laboratory, Melrose Highlands, Mass., to collect parasitized caterpillars, rear them and breed out the parasites. The parasites were then shipped to the Entomological Laboratory at Fredericton, N.B., and distributed from there to various selected localities. Altogether 16,548 cocoons of the hymenopterous parasite, *Apanteles lacteicolor*, 5,738 puparia of the parasitic fly *Compsilura concinnata*, and 475 cocoons of the hymenopterous parasite *Meteorus versicolor* were secured and shipped. In addition, 200 adults of the imported European predaceous beetle *Calosoma sycophanta* were collected and shipped to New Brunswick, and 975 larvæ were collected, fed and allowed to hibernate.

In addition to the importation and colonization of these native parasites of the Gipsy and Brown-tail Moths, imported originally by the United States Government from Europe and Asia, a careful study of the native parasites of certain of our commoner insects, such as the Tent Caterpillar (*Malacosoma disstria*), and the Fall Web-worm (*Hyphantria cunea*) was begun, such an investigation being very necessary in connection with the work on the natural control of lepidopterous insects.

INSECTS AFFECTING FIELD CROPS.

As complete an investigation as possible was made of the outbreak of the Cutworm, *Porosagrotis orthogonia,* which had proved so injurious to wheat and oats in southern Alberta in 1912, and to which reference was made in the last annual report. Mr. Arthur Gibson, Chief Assistant Entomologist, spent some time in the infested district in the spring, and Mr. E. H. Strickland, Field Officer, was stationed at the Experimental Farm at Lethbridge, where an entomological laboratory was established for the purpose of studying this insect and other similar troubles. Control experiments were carried out, but the feeding habits of the larvæ rendered most of them valueless. Fortunately, natural causes were responsible for a very marked decrease in the abundance of the insect.

The Army Worm, *Leucania unipuncta,* reappeared and Mr. Norman Criddle reported its occurrence in southern Manitoba.

Experiments were carried out at the Entomological Laboratory, Covey Hill, Que., and at Bowesville, Ont., on the control of locusts by the bacterial disease caused by *Coccobacillus acidiorum* d'Herelle, a culture of which was obtained from the Pasteur Institute, Paris (France).

In co-operation with the Bureau of Entomology of the United States Department of Agriculture, an investigation on the White Grubs (*Lachnosterna* spp.) was begun. Field laboratories were established at Aweme, Man., and Strathroy, Ont., where the local species of *Lachnosterna* were studied. The lengthy life-cycle of the insects will necessitate an inquiry extending over several years. Observations on various insects affecting cereals and other field crops were also made.

A special inquiry was undertaken regarding extensive injuries to winter wheat in southern Alberta. The occurrence of Eelworms (*Nematodes*) in injured plants suggested a possible cause, but further investigation does not appear to place entire responsibility upon these pests.

INSECTS AFFECTING FRUIT CROPS.

In Nova Scotia the investigations on the Bud Moth of apple, which is one of the worst apple pests in the fruit-growing sections, and on the Green Fruit-worms (*Xylina,* spp.) were continued by Mr. G. E. Saunders. Our work on the former insect, both in the laboratory and in the experimental orchards, where spraying experiments have been carried on, has enabled us to determine the correct time to spray and the materials to use to prevent bud-worm injuries.

At the Entomological Laboratory at Covey Hill, Que., Mr. C. E. Petch continued his work on the Apple and Plum Curculios, but progress was seriously affected by the almost complete failure of the apple and plum crops in that region.

Mr. W. A. Ross completed a third season's work on the Apple Maggot (*Rhagoletis pomonella*) in the Niagara fruit district, and has now tried out most of the methods of control usually recommended, including soil insecticides, spraying, poisoning and cultural methods. He also commenced a study of the Aphides of the region.

In British Columbia, Mr. R. C. Treherne completed his studies of the Strawberry Root Weevil (*Otiorhynchus ovatus*) and a bulletin on the insect and its control is now in the press. Studies were also made on the Lesser Apple Worm and Bud Moth. Mr. Tom Wilson continued the work of assisting the Indians in fruit culture, with increasing success.

INSECTS AFFECTING FOREST AND SHADE TREES.

At the request of the Provincial Government an investigation of the insects destroying merchantable timber in British Columbia was begun by Mr. J. M. Swaine, who spent some time in the southern part of the province. A preliminary survey

indicated that an immense amount of valuable timber is being destroyed by various injurious insects which were studied. A preliminary account of this investigation, in which control measures are recommended, has been prepared and is now in the press.

Serious insect damage was discovered in Stanley Park, Vancouver, B.C., and the control of the responsible species is now being studied with a view to advising the Parks Board in regard to the conservation of this valuable piece of virgin forest.

The Forest Tent Caterpillar again defoliated large areas of poplar, birch, maple and other deciduous trees in Eastern Canada, particularly in Quebec and New Brunswick. It was found that bacterial disease destroyed large numbers. The spruce Budworm and Larch Sawfly continue to spread; the former being very prevalent in the New Brunswick forests.

INSECTS AFFECTING DOMESTIC ANIMALS AND MAN.

An investigation was undertaken with a view to testing the value of various substances as insecticides in the destruction of house-fly larvæ in manure piles, as the control of the house-fly under rural conditions is an important question. Of the various insecticides used, chloride of lime scattered over the manure as it is piled gave the best results.

Further inquiries were made concerning the obscure disease known as 'tick paralysis' in children in British Columbia.

MISCELLANEOUS WORK.

Experiments have been made on the destruction of mill-infesting insects by super-heating as a substitute for fumigation, with gratifying results. The study of insects affecting greenhouses has been continued, chiefly in Toronto greenhouses, by Mr. Ross.

APICULTURE.

During the year a beginning has been made in the organization of the apicultural work on the different Experimental Farms with a view to giving the subject the attention it deserves, and which is now rendered possible by the appointment of Mr. Sladen. He has continued his work on queen-rearing and varietal tests, a number of queens having been imported from European countries. Bees have also been shipped successfuly in wire 'combless' cages from Ottawa to Indian Head, a distance of over 1,600 miles.

GENERAL.

One of the outstanding features of the year's work has been the demonstration of the value of the policy which has been extended during the year of establishing field or regional laboratories. The direct contact with the farmers and fruit-growers, and with their problems, has increased the value of the work, and the opportunities of rendering immediate assistance to a degree more in keeping with the requirements; as a result great satisfaction and appreciation have been expressed by those in whose interests we are working.

During the year the Dominion Entomologist has visited the different parts of the Dominion, and also visited Oregon, California and Utah, where the entomological conditions, particularly in regard to the Potato Tuber Moth and the Alfalfa Weevil were studied. Messrs. Gibson, Swaine and Sladen, in addition to their other duties, attended meetings and delivered addresses.

DIVISION OF ANIMAL HUSBANDRY.

The scope of work of this Division includes directly the care, breeding, feeding, housing and marketing of horses, cattle, sheep and swine and their products on the Central Experimental Farm, together with the testing of food stuffs and the testing of methods in care and management and of all machinery pertaining thereto. In consultation with the branch Farm Superintendents, this Division also assists largely in these various operations on all the branch Farms where live stock is maintained, thus systematizing and consolidating all the live stock experimental work on the Dominion Experimental Farms.

For the past year the animal husbandry work on the Central Experimental Farm has been fairly interesting, considering the numerous and varied difficulties encountered. The summer feeding of live stock was carried on under most adverse conditions. The pasture area allowed to each class of stock is exceedingly small, only a little over 19 acres being available for this purpose. Owing to the early spring frosts which killed out the clover, followed by the severe drought of midsummer, not only were these small pastures severely checked in their growth, but the soiling crops supplied by the Field Husbandry Division were also very limited. However, the copious fall rains and the late open season largely assisted in putting all live stock in good condition before the winter months.

On October 11, this Division suffered a severe setback in the loss by fire of the main dairy barn, calf barn, bull barn and steer barn. This necessitated the temporary discontinuance of most of the experimental work on this Farm, not only with dairy and beef cattle, but also with horses, sheep, and swine, since the buildings in which these latter classes were housed were of necessity utilized in some measure for the housing of cattle. With the completion of the new buildings, now under construction, all such postponed work will be again taken up.

There are 465 head of live stock at present in the stables, made up as follows: 140 cattle, 27 horses, 81 sheep, and 217 swine.

HORSES.

Although the horses on the Central Experimental Farm are still expected to do all the labour connected with the various Divisions, yet the numbers now include six pure-bred Clydesdale mares and four grade Clydesdale mares, all of a uniform type and exceptionally good quality and breeding, with which experimental breeding work is being started. A number of these mares are in foal, and experimental work along the lines of feeding, care, management and housing of pregnant mares and foals is being planned.

The horse labour supplied to the various Divisions on the Central Experimental Farm amounted to 6,889 days, which, at the conservative valuation of 70 cents per day, gives a total return of $4,822.30.

No experimental horse feeding work was conducted during the past year.

DAIRY CATTLE.

The pure-bred dairy herds now in the stables are Ayrshire, Canadian, Holstein, Guernsey and Jersey. All these herds have made normal growth during the past year and have given satisfactory returns.

Aside from the pure-bred herds, there are two excellent grade herds—Holstein and Ayrshire—which have given an excellent account of themselves, both in their production and in their breeding qualities. These grade herds have also been utilized quite largely in dairy cattle feeding experiments.

DAIRY CATTLE FEEDING EXPERIMENTS.

The investigational work along the lines of the greatest number of cattle which may be profitably fed on a 200-acre farm is being continued, and with most interesting results.

A continuation and expansion of experimental feeding work, as reported in the year 1913, has been conducted during the past year. A complete summary of this investigational work to determine the feeding values of molasses and molasses meals may be found in the detailed report of the Dominion Animal Husbandman.

MILKING MACHINES.

As previously reported, a Sharples Mechanical Milker was installed on the Central Experimental Farm in July, 1912. This machine has given fairly good satisfaction. In order to get further data as to the value of milking machines, a Burrell-Lawrence-Kennedy machine was installed in September, 1913. The purpose of these milking machine tests was to compare each machine with the other and also with good hand milking as to thoroughness, to determine their effect upon the cows, to examine into the purity of the milk drawn in this way, to compare the machines with hand milking for cost and to get some information as to the durability of the machines. Unfortunately, both these machines were destroyed when the barns were burned. However, it is proposed to continue these tests as soon as the new buildings are completed.

DAIRY COW RETURNS.

It will again be noted that the quality of the dairy cattle on the Central Experimental Farm has made a marked improvement. The following is a brief summary showing the returns of some of the cows in the various herds, the profits being based on the following valuations: Butter, 30 cents per pound; skim-milk, 20 cents per hundred pounds; pasture, $1 per head per month; hay, $7; straw, $4; green feed, $3; and meal, $25 per ton.

No. of Head.	Age.	Breed.	Average Days in Milk.	Average Pounds Milk produced.	Average per cent Fat.	Average Profit over Feed betweencalvings (labour, manure and calf not included.)
	Years.			Lb.	p.c.	$
67	3 and over..	All breeds and grades...	348	7,333	4·25	60·30
11	2	Five breeds.....	396	5,535	5·13	50·31
5	3 and over..	Ayrshire.....	326	8,518	4·06	73·55
5	3 "	Canadian.. ..	295	4,885	4·90	44·79
5	3 "	Guernsey..	541	7,520	5·16	74·05
5	3 "	Grade Ayrshire	422	8,672	4·08	82·86
5	3 "	Grade Holstein	328	10,808	3·44	86·54
5	3 "	Holstein	315	11,221	3·54	85·53
5	3 "	Jersey.....	400	6,272	5·45	71·54

In the above valuation, butter at 30 cents per pound is equivalent to milk at only $1.65 per hundred pounds, yet, in reality, the manufacture and sale of cream cheese, Coulommier cheese and certified milk, with a large part of the milk, has netted $3 per hundred pounds. However, the above valuations are useful for the comparison of these productions with the average herd throughout Canada.

The possibilities of opening up fancy cheese markets by the average farmer in the vicinity of the larger Canadian cities has been well demonstrated. The increased profits from the same may be readily seen.

BEEF PRODUCTION.

Steer feeding investigational work, comparing rations and food stuffs, was again under way on the Central Experimental Farm, but was of necessity discontinued owing to the loss of buildings. The steers purchased for this work were forwarded to the Experimental Farm, Nappan, N.S., for similar purposes.

SHEEP.

The conducting of investigations with sheep on the Central Farm is continued under the same difficulty, namely, the great shortage of available land. Breeding work, on a small scale, with Shropshires and Leicesters, has, however, been most successful during the past year, and these small flocks are now in excellent condition. Lamb feeding experimental work anticipated for the winter of 1913-14 was of necessity postponed, as the sheep buildings were largely utilized for the housing of cattle. A special lamb feeding shed was constructed during the past year, in which further studies in lamb feeding are to be conducted.

SWINE.

Considering the shortage of pasture, another successful year is to be reported for swine husbandry. With the exception of one line of experimental feeding work with brood sows continued on a small scale throughout the winter, no special work was under way. Further investigational work along the lines of feeding of tankage to brood sows and litters is being taken up upon a large scale.

Three breeds of swine are kept, Yorkshire, Tamworth and Berkshire, and a fairly successful breeding season may be reported.

LIVE STOCK BUILDINGS.

The Animal Husbandry Division has during the past year prepared or assisted in the preparation of plans and specifications for a large number of live stock buildings erected on branch Farms and Stations. The new barns at the Central Experimental Farm, Ottawa, are also being planned and constructed under the immediate supervision of the Animal Husbandry Division. Many plans of farm buildings and specifications for the same have also been sent out during the year, free of charge, to individual farmers who requested assistance along such lines. Such inquiries are being encouraged as much as possible.

MISCELLANEOUS.

The correspondence of this Division, pertaining to feeding, breeding, care and management, and housing of animals, together with the prevention and treatment of many of the minor ailments of all classes of stock, has largely increased during the past year.

The Dominion Animal Husbandman, in attending to his duties outside the Central Experimental Farm, has officially visited many of the branch Farms on which live stock work is being conducted. In addition to such official trips, both the Dominion Animal Husbandman and the Assistant Dominion Animal Husbandman have made many trips attending meetings in various parts of Canada, judging at numerous exhibitions, and studying live stock conditions and the needs for experimental work and demonstrational work relating to live stock.

DIVISION OF FORAGE PLANTS.

The work of the Division of Forage Plants is in general of an entirely scientific nature, the aim being:—

1. To produce superior varieties and strains of forage crops.
2. To ascertain the value of the different varieties for the different environments of Canadian soils and climate.
3. To investigate thoroughly the value of both native and foreign plants that are or may be used for fodder.

Owing to the fact that the Division has only completed the second year of its existence, the breeding work is not very far advanced, and definite results cannot be expected within the next two or three years.

The breeding work which at present demands the greater amount of attention is that with leguminous forage plants and grasses. Among these two classes of plants the species with which work on as large a scale as possible is being conducted are: Alfalfa, red clover, alsike clover, timothy and orchard grass.

CLOVERS AND ALFALFA.

In the breeding of leguminous forage plants, including alfalfa and clovers, two main objects are kept in view, namely, breeding for increased hardiness and breeding for increased yield and superior quality.

At present all the various commercial varieties of alfalfa and clovers are composed of numerous radically different types, a few of which possess the desired characters, and many that do not. This fact was very clearly demonstrated on the alfalfa plots growing at the Central Experimental Farm during the early spring of 1913 when they were put to a very severe test by the extreme freezing and thawing. This test was so severe that some of the plots that had previously withstood several winters were almost entirely killed out. The remaining plants, however, may be said to represent hardy types, and the most desirable of them have been used as a basis of material for further breeding work, and were either self-fertilized or crossed by hand. The resulting seed will be used next year to obtain individuals for pedigree breeding.

A similar course of procedure is also well under way with red clover and alsike, the only difference being that, as the different individual plants of these two clovers are sterile to their own pollen, the pedigree breeding must be accomplished by the crossing of specially selected mother plants.

In order to secure a strain of variegated alfalfa of known origin, crosses were made between the true alfalfa (*Medicago sativa*) and yellow lucerne (*Medicago falcata*). The individual plants obtained from the seed resulting from this cross will be self-fertilized, and subsequent desirable segregations fixed by repeated self-fertilization.

As a source of material for further breeding work, 1,200 individual plants of alfalfa of varied type were transplanted into the field, and it is hoped that next year many desirable types will appear that will be fixed by either self-fertilization or crossing.

A corresponding number of individual plants of red clover were also transplanted to the field during July, and will be used as a source of material for the selection of suitable mother plants for crossing.

In addition to this, a line of experiments for the production by mass selection of hardy strains of red clover and alsike, was started this season at several of the branch farms and at Ottawa. Seed was obtained from several private growers and seedsmen in different parts of Canada. Each lot of seed has been used for two plots

at the branch Farms and three at Ottawa, and it is hoped that it will be possible to show, by actual figures, the comparative hardiness and value of these different regional strains. By conducting similar experiments during succeeding years from the seed that will be obtained from these and following plots, it is only reasonable to suppose that a gradual elimination of the undesirable and less hardy individuals will take place, and a more hardy strain be finally produced.

GRASSES.

Timothy.—During 1912, forty-two lots of individual timothy plants were each obtained from the seed of a single wild plant, and in 1913 the entire lot amply demonstrated the polymorphous character of the species. Also the fact that many of the lots were very similar in general character, showed that the morphological characters of these plants are in general hereditary.

Seventeen of the most vigorous and desirable plants among those lots were isolated and self-fertilized. From the resulting seed, individuals will be obtained next year, which will be tested for characters that would make them worthy of further investigation.

From the year's experience it is a moderate estimate to state that it will be possible to produce a uniform strain of timothy within the next few years, having a yielding capacity 25 per cent greater than any timothy now obtainable commercially.

As further material for future breeding work, 2,400 individual timothy plants obtained from lots of seed produced chiefly in western Canada, were transplanted into the field during the summer.

Orchard grass.—Work similar to that with timothy was also started in 1912 with orchard grass. In this species the range of type is even greater, while the morphological characters seem to be as readily transmissible.

From the 200 individual plants transplanted into the field in 1912, ten of the most desirable were selected and self-fertilized. From the seed obtained from these plants, individuals will be obtained and subjected to a test similar to that for timothy.

Other grasses.—For the season of 1914, work similar to that with timothy and orchard grass will be started with western rye grass, meadow fescue and one or more of the, at present, uncultivated species of *Agropyrum.*

FIELD ROOTS AND INDIAN CORN.

During the season of 1913 the usual variety tests with field roots and Indian corn were conducted at the Central Experimental Farm and at the various branch Farms, a total of 27 varieties of turnips, 19 of mangels, 6 of sugar beets and 15 of corn being tested.

Previous to 1913 each variety was grown in a single plot and the yield per acre calculated from the same. For the season of 1913, however, the tests were conducted in duplicate plots, situated in different parts of the field, thus eliminating in some measure the disturbing influence of varying soil conditions upon the comparative yield of the varieties, by averaging the results from both plots. The results for the season from this method of variety testing were very instructive, and it will be continued in the future.

For the coming season, several apparently inferior varieties have been dropped from the tests, while, on the other hand, a few new ones have been introduced. Among the introductions into this line of experiment are several promising Swedish and Danish varieties of turnips, mangels and carrots.

Root breeding.—From several of the varieties of mangels, carrots and turnips that have averaged highest in dry matter per acre for the past ten years, 200 seed roots were selected in the fall of 1913. These roots have been carefully stored and will be planted in the spring of 1914, thus making a start in systematic root breeding.

HERBARIUM.

The collection of Canadian grasses and sedges started in 1912 has been increased during the past year to the extent of several hundred species.

Arrangements have also been completed with the Botanic Garden, Lund, Sweden, to exchange collections of Canadian flora for grasses and sedges from Sweden, Norway, Finland and Denmark. In accordance with this arrangement a duplicate collection of 1,000 sheets has been exchanged for an equally large collection of grasses and sedges from northern Europe.

BROOM CORN.

The experiments with broom corn have so far shown that an early seeding is essential in the vicinity of Ottawa. In 1913, a small quantity of marketable brush was produced, but whether the crop will prove profitable cannot, as yet, be determined from the results at the Central Experimental Farm.

POULTRY DIVISION.

The work of this Division is to investigate all poultry problems that are of interest to farmers and poultrymen. This experimental work includes breeding, incubation, brooding, rearing, feeding, housing, the production of flesh and eggs, diseases, etc., and to carry out this work turkeys, geese, ducks, guineas and ordinary fowl are utilized.

The major portion of the experimental work is conducted at the Central plant at Ottawa, where special equipment and assistance are maintained. The Experimental Farms and Stations at which poultry plants are being installed are used more in the nature of demonstrations, though experiments having a local value are also conducted there.

The plant at the Central Farm, Ottawa, consists of about 5 acres, upon which the main buildings are erected, and 12 to 14 acres of park and water at a short distance away, where the experiments in turkeys and waterfowl are being conducted. This latter portion has been but lately added to the plant, and the buildings as yet are not complete.

During the past year several new buildings have been added to the plant on the Central Experimental Farm; these consist of a feed and storehouse; an experimental breeding house, and a cockerel house, which is also used as a brooder house.

As a rule, about 300 laying hens are kept on the Central plant, including the most popular utility breeds and varieties. This year two breeds of turkeys, five of ducks, three of geese, and one of guinea fowl are being introduced.

The incubators are one Mammoth of 1,200-egg capacity and eight or ten small lamp machines of the recognized standard varieties. The brooders consist of individual electric hovers placed in one wing of the cockerel house, one room brooder stove and a number of individual hovers, portable and otherwise.

Poultry work has not as yet started at all of the branch Farms and Experimental Stations. This year, however, work was started at Agassiz, B.C., Invermere, B.C., Lethbridge, Alta., Lacombe, Alta., Indian Head, Sask., Brandon, Man., Cap Rouge, Que., Nappan, N.S., Kentville, N.S., Fredericton, N.B., and Charlottetown, P.E.I. A start on the other Farms will in all probability be made next year. This work is more in the nature of 'farm poultry' than 'poultry farms.' The extent of the

stock which is being kept at these Farms is enough for one man to look after. At some of the Farms only one breed is kept but never more than three. It is not the intention to recommend to the farmer the keeping of several varieties, but rather the proper choice of a suitable variety followed by judicious selection, year after year.

At all of the plants it is the intention to have both portable and permanent houses; the portable house is small enough to be moved easily from place to place, the permanent house large enough to hold about 100 hens, which is the size of the flock recommended for the average farmer. At several of the Stations, notably Cap Rouge and Lacombe, turkeys, geese and ducks are being experimented with, and at Invermere, B.C., a specialty is being made of turkeys.

One of the main experiments which are being conducted is the production of a laying strain in several of the utility varieties. Just as soon as such a strain is established at the Central Experimental Farm, cockerels from this strain will be supplied to the Branch Farms for breeding purposes. The cockerels from subsequent matings will be available to the farmers and for those wishing breeding stock from the branch Farms. Practically no stock or eggs will be sold from the Central plant, as the surplus stock will be distributed to the outlying Farms and the eggs used for incubation and experimental work.

As the male is recognized as exerting more influence than the female on the high production of eggs, this system of supplying cockerels from high egg-producers should result, in time, in good laying strains on the branch Farms and they in turn, will distribute the cockerels raised to the farmers. The final results in the farmer's flock can mean only a higher average egg production.

Experiments in cotton front houses are being continued, and among the new experiments are: Breeding, to determine how far the male and the female are responsible for stamina, vitality, fertility, production of egg and meat, colour of plumage, type, sex, etc.; incubator and fertility tests that cover numerous phases of the subjects; brooding to discover cause and remedy of mortality among chicks; confined runs versus free range to determine effect on breeding stock and reproduction; feeding screenings from Port Arthur elevators to determine their value for poultry; the shipping of eggs by parcel post versus express; the practicability of shipping breeding eggs that are partially hatched, and from which the infertile eggs have been removed; ducks, Indian Runners for egg production and Pekins for market purposes; geese as a farm crop, best method of management, feeding and rearing turkeys; artificial versus natural methods; study of Blackhead, etc.

TOBACCO DIVISION.

The experimental work of this Division, as distinguished from the supplying of information to the public through the medium of reports, bulletins, correspondence and samples, is conducted at the Central Farm, Ottawa, and at the Tobacco Stations at St. Jacques l'Achigan and Farnham, in Quebec, and Harrow in Ontario.

Results in 1913.

CENTRAL FARM.

Fermentation.—The fermentation of the 1912 tobacco crop was finished by the end of May, 1913, on which date the packing was commenced. At the present time, the tobaccos are finishing the ripening process in the boxes.

Crop.—The seed sown germinated well and furnished an abundance of good material for transplanting early in June. The plantation specially devoted to the growing of tobacco for seed gave an abundant yield.

Among the new varieties tried, certain Italian hybrids gave results which encourage the hope that they may be used in the production of the yellow tobaccos in southern Ontario.

FARNHAM, QUE.

Crop. Sowing was very successful and the seedlings were fit for transplantation late in May. This work was, however, hindered by rainy weather and injuries by insects.

One cannot obtain at once, on land freshly broken from old meadow, tobacco of an elastic texture, but the yield in weight was satisfactory, except on one plot which could not be manured, and received only one application of artificial fertilizer.

The principal varieties grown were the Comstock Spanish, Havana Seed Leaf, Yamaska and Big Ohio X Sumatra. They gave tobacco of a fair quality with the exception of Big Ohio X Sumatra, the product of which was somewhat lacking in elasticity.

Improvements made.—Among the principal ones may be mentioned new fencing, the drainage of some 15 arpents of land, and the building of a dam to control the brook running across the Station.

HARROW.

Sowing.—This was, as a whole, successful and an abundance of good plants was obtained. The conclusions from the experimental work of the year may be summarized as follows: Sow early, replace the cotton covers by glass, sow thinly, renew the soil in the seed bed often, and disinfect it either by formalin or steam.

Brown rust of the seedlings was frequently noticed. Not only is the yield insufficient from attacked plants, but each time a diseased specimen is used in transplanting, the evil is increased by spreading it over the whole field.

This disease was made the subject of communications to the press, giving the nature of the disease and the methods of fighting it. These methods will be proved by experiment.

Plantations.—These suffered at first from drought. Rains later brought on a normal growth when on August 3, a very violent hail storm destroyed all hope of a crop.

EXPERIMENTAL STATION FOR PRINCE EDWARD ISLAND.

CHARLOTTETOWN, P.E.I.

CHARACTER OF SEASON AND GENERAL CROP NOTES.

The winter of 1912-13 was exceptional in character. There was severe frost which entered the ground to a great depth owing to the long periods when the ground was bare. Snow lay on the ground very little more than one month, or from the middle of February to the middle of March. Much injury was done by the sudden changes of March, which caused great freshets washing out huge trenches and gullies in unlooked-for places. The very warm weather of April brought the grass and trees forward about two weeks ahead of previous years. May was so cool that growth almost remained at a standstill. June was similar to May. The weather was favourable to the thorough working of the land and the transplanting of vegetables and flowers. The grasses and clovers thickened up in the bottom but made but little growth. Corn remained at a standstill. July was favourable for all crops, and during August a good hay crop was saved in splendid condition. There was good harvest weather in September. The rainfall of October was excessive and almost continuous. The warm, moist weather was ideal for the growth of the roots, but sprouted the late grain very badly, the greater part of which was not saved in good condition until the drying winds of November came. A light frost occurred Sep-

tember 30 which only touched plants on low lands. No frost occurred in October. The weather conditions favoured the late annual and perennial flowers so that there was wonderful autumn bloom. The lawns remained green throughout November. The very heavy snowfalls and severe frosts made the winter of 1913-14 one long to be remembered.

NEW AREAS.

The areas of land acquired just previous to the commencement of the fiscal year were cleared of unnecessary trees, fences and rubbish. New fences were constructed around them and the posts painted.

BUILDINGS.

Two colony houses, a Simplex brooder house and a few small rearing buildings were added to the poultry plant. Some repair work was done, including the putting of a foundation under the kitchen of the Superintendent's residence.

UNDERDRAINAGE.

Thirty thousand feet of drain tile was purchased for the new areas, and tile was laid on most of the Conolly property before winter set in. The remainder will be laid early in the spring of 1914.

HORSES.

A team of draft mares was purchased locally in the fall for farm work. The six horses at the Station on March 31, 1914, have been healthy throughout the year and are ready for the spring work.

BEES.

Two colonies of Italian bees were purchased locally. Five colonies of black bees were ordered for this section by the Dominion Entomologist from Bridgetown, N.S., in the spring of 1913.

The bees from Bridgetown arrived in very bad condition, the hives and combs being broken and the bees killed so that the express company paid two-thirds of the first cost of the colonies. There was left of this shipment of black bees one fairly strong colony and two very weak ones. The weak ones were built up by transferring combs of brood from the Italian colonies. Italian queens were also introduced into those colonies.

The bees produced a good quantity of honey which was extracted. They refused to fill any comb sections. On November 7, 1913, thirty-one pounds of sugar syrup was fed to them. The five colonies came through the winter in good condition.

CO-OPERATIVE WORK.

Co-operative work was continued with cereals on a number of farms. The results of these and of the experimental plot work with cereals will be found in the detailed section of this report.

FARMERS' PICNICS AND VISITORS.

Nineteen Farmers' Institutes came to the Farm during the summer. The leading men of the province and many distinguished visitors added much to the educational value of these pleasant picnics by giving instruction and delivering addresses that were appreciated by the farmers and their wives. The attendance increased

greatly over the previous year, reaching the 400 mark on August 21, when four Institutes arrived on the same day. The number of visitors recorded during the year was 6,906.

EXHIBITIONS AND SEED FAIRS.

The Station exhibits at the county fairs and the provincial exhibition were much larger than on previous years and attracted much favourable comment. A display was made at the first Annual Flower Show on August 28 and 29. This show proved to be a great success. It was held by the Floral Association of Prince Edward Island, and the interest in improving the residences and parks of the towns and the homesteads in the country is quite marked. The Superintendent judged at the fall exhibitions and the seed fairs held during the winter.

AGRICULTURAL MEETINGS.

The Superintendent gave addresses at the fall exhibitions and at the seed fairs and at as many institute meetings as time permitted. Many farmers were visited personally in different sections of the province, and farm work discussed.

Instruction was given in Field Husbandry to the students taking the Short Course in Agriculture held at Charlottetown during the first part of January, 1914, and at the several Short Courses in Household Science on the 'Improvement of the Farm Home.'

At the request of the different Boards of Trade, the Superintendent gave illustrated lectures in Charlottetown and Summerside on 'Landscape Gardening' and the 'Improvement of the Home Grounds.'

CONVENTIONS AND ASSOCIATIONS.

The Superintendent attended the various agricultural conventions and association meetings in the province; the Nova Scotia Fruit Growers' Association at Kentville, N.S., and the associations held in connection with the Maritime Winter Fair at Amherst, N.S.

DISTRIBUTION OF SEED POTATOES AND SALE OF SEED GRAIN.

Thirteen samples of potatoes were sent out in April; ten lots of Banner oats and three lots of barley were sold to farmers for seed purposes in the spring of 1913. A quantity of Banner oats has been registered with the Canadian Seed Growers' Association and sealed by their inspector and will be sold to the farmers in the spring of 1914.

METEOROLOGICAL RECORDS.

Months.	Temperature Fahr.				Precipitation.					
	Maximum.		Minimum.		Rainfall.		Snowfall.		Total Pre.	Bright Sunshine.
	Date.	Degrees.	Date.	Degrees.	Days.	Ins.	Days.	Ins.		
April	26	78¾	8	17·5	12	3·09	5	7·75	3·86	148·8
May	6	68¾	9	28·5	20	2·9	1	1	3·	195·6
June	11	73	1	33·5	14	1·27	.....	.....	1·27	255·5
July	4	83·5	1	44	14	4·01	.....	.....	4·01	222·2
August	16	79·5	21	43	10	2·89	.....	.....	2·89	251·2
September	2	75	30	39	13	3·98	.....	.....	3·98	182·3
October	7	70	1 & 31	33	17	7·71	.....	.....	7·71	66·3
November	10 & 11	61	29	18	10	1·65	4	4·4	2·09	101·6
December	8	56	16 & 17	7	6	2·11	10	16·5	3·76	62·5
1914.										
January	25	45	21 & 23	− 6	2	·73	11	32	3·93	79·6
February	8	43	22	−21	3	·08	6	35·5	3·63	138·3
March	17	44	21	8	7	3·46	5	14·85	4·94	128·5
Total Annual	.....	.....	.....	.....	128	33·88	42	112·00	45·07	1,832·4

Note.—One inch of rain is figured as equivalent to ten inches of snowfall.

EXPERIMENTAL FARM FOR NOVA SCOTIA.

Nappan, N.S.

THE SEASON.

During the winter of 1912-13, the snowfall was light, with no severe frosts in the latter part of the season. Over 2 inches of rain fell on March 27, doing considerable damage by washing, especially on the ploughed sidehills.

The weather in April was variable and broken, with a very warm wave from the 21st to the 26th. Seeding started on May 6 and was general by the 10th. It was retarded by wet, cold weather, frost being recorded on nine nights between the 1st and the 18th. Seed sown germinated very slowly.

June was cooler than usual and the rainfall was lighter. Seeding and planting were fairly through by the 21st. Growth was slow until the latter part of the month. July was dull and wet, but growth was rapid. Haying was delayed but most of the clover hay was secured in good condition.

August was brighter and most of the grain was ready to cut by the end of the month. September was, on the whole, suitable for harvesting operations and the greater part of the early-sown grain was harvested without damage, but that sown late was unfit to cut until October and was greatly injured by the frequent rains of that month.

November gave seasonable weather, but the heavy October rains had made the land so wet that the root harvest was carried on under great difficulties and ploughing could not be done to any advantage. Cold winter weather set in on December 27.

NOTES ON THE WORK.

Live stock.—The experiment of grading up the common cows of the district by the use of a pure-bred sire, commenced in 1911, was continued successfully this year and further data of interest gathered, though conclusive results cannot be expected for some time to come.

Up to date, all progeny give strong indications of being superior to the foundation stock.

The experiment in feeding steers was very successful, both in data gathered and profit made. The steers were divided into two main groups, on a basis of type, into good butchers and good stockers. These were each subdivided into heavy-fed and light fed groups, each of which was further subdivided into lots fed different rations. Details of the experiment will be found in the report of the Division of Animal Husbandry.

A sheep feeding experiment similar to that conducted in 1912-13 was carried on. Fifty-six grade wethers were purchased for the test. These were divided into four lots and fed on different rations. Lots 1 and 2 received clover hay and meal; lots 3 and 4 timothy hay and meal; lots 1 and 3 also received roots in addition to the meal ration. The average net profit per head in each lot was: Lot 1, $2.51; lot 2, $2.53; lot 3, $2.26; and lot 4, $1.95.

Owing to the limited accommodation for swine, little work was done in experimental feeding. New colony houses were built and all swine were wintered in them. While they took just a little more attention and feed when wintered in this way, their healthy condition more than compensated for it.

A new flock of pure-bred Shropshire sheep has been established. These animals are more typical of the breed than were the former flock. The Leicester flock formerly at this Farm was transferred to the Experimental Station, Charlottetown, P.E.I.

A number of new colony houses for poultry were built. These are of different styles in order to study the relative suitability to the district. Three breeds of fowl are now kept, Barred Rock, White Wyandotte and White Leghorn.

Cereals, Corn for Ensilage and Roots.—In cereals, twelve varieties of wheat ranged from 24 bushels to 42 bushels per acre. Twelve varieties of oats ran from 48 bushels 8 pounds to 61 bushels 26 pounds; six varieties of two-row barley from 33 bushels 16 pounds to 50 bushels and six varieties of six-row barley from 29 bushels 3 pounds to 45 bushels 40 pounds.

The buckwheat plots did not do as well as they might, owing to the presence of couch grass. Five varieties were sown with yields from 32 bushels 24 pounds to 44 bushels 8 pounds.

Peas were very late and the returns, owing to the injury from heavy rains, were not worth reporting.

Five varieties of ensilage corn ranged in yield from 12 tons 1,500 pounds to 16 tons 700 pounds per acre.

Sugar beets did fairly well, the three varieties tested yielding from 13 tons 1,000 pounds to 13 tons 1,500 pounds. Twelve varieties of turnips gave yields of from 30 tons 1,000 pounds to 42 tons 1,000 pounds per acre; eleven sorts of mangels from 16 tons 500 pounds to 32 tons 1,200 pounds; six varieties of carrots from 16 tons 1,000 pounds to 23 tons 1,000 pounds. Twenty varieties of potatoes gave from 173 bushels 20 pounds to 556 bushels 40 pounds.

Fruits and vegetables.—The apple crop was hardly up to the average, and scab was much in evidence. On the Farm, the small commercial orchard made very vigorous growth during the season, and some of the early varieties, such as Duchess and Wealthy, produced some fruit.

The season was not favourable to bush fruits, the yield was only medium and the growth fair. Strawberries were below the average in yield owing to the previous

wet autumn preventing their being properly cleaned out. There was also some winter-killing.

The vegetable garden was placed in a piece of ground naturally wet, which, with the heavy rains and the fact that the drains became plugged up with tree roots, kept the ground very heavy throughout the season.

Both annual and perennial flowers did exceptionally well.

An exhibit of farm produce was made at Halifax, September 2 to 12, and also a honey exhibit at the Maritime Winter Fair.

During the year, the Superintendent gave a number of addresses at various points throughout the province.

The number of visitors during the year was about 1,369.

METEOROLOGICAL RECORDS, NAPPAN, N.S.

MONTH.	TEMPERATURE F.			PRECIPITATION.			Total Sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	
1913.	°	°	°	Inches.	Inches.	Inches.	Hours.
April	40·03	71	14	3·01	4·5	3·46	132·70
May	47·75	67	26	2·38	.....	2·38	169·15
June	54·56	74	31	1·97	.....	1·97	265·90
July	62·33	82	41	4·98	.....	4·98	226·05
August	61·00	80	33	3·76	.....	3·76	238·10
September	54·59	78	31	2·70	.....	2·70	165·95
October	55·28	72	28	7·83	.....	7·83	71·30
November	38·09	65	10	1·63	4·0	2·03	115·45
December	27·50	55	0	2·65	16·0	4·25	80·20
1914.							
January	13·5	46	19	1·80	12	3·00	92·40
February	7·5	42	27	·30	23	2·60	138·50
March	30·17	46	8	1·03	2	2·13	107·85

EXPERIMENTAL STATION FOR THE ANNAPOLIS VALLEY,

KENTVILLE, N.S.

THE SEASON.

April, on the average, was about 3 degrees higher in temperature than the average of previous seasons, and May on the other hand averaged 3 degrees lower than previous seasons. The result was that apples started to leaf out toward the latter part of April, but made little growth until the latter part of May. This gave an excellent opportunity for apple scab to obtain a start on the partially-opened leaves. Where the trees were not sprayed early to protect the partially-grown foliage, scab developed rapidly, and from this infection a great loss resulted to the growers from spotted fruit and destroyed foliage. The following months to October were, on the average, 1 degree in temperature lower than the average of previous

years. October was abnormally high in temperature and the average was nine degrees above that of former seasons. November and December were seasonable months. January during the first two weeks was very cold, the thermometer registering to 5 degrees below zero. This was followed by a warm spell and the ground completely thawed out. From the 10th to the last of February the coldest weather ever experienced in the valley is reported, the temperature going below zero on eight different days and falling to as low as 17 degrees below zero. There was little snow on the ground, and the frost entered to a great depth. High winds accompanied the cold, and cellars supposed to be frost proof were penetrated.

The rainfall was light during June and August, and crops suffered, the potato crop especially being much reduced in yield. October was an unusually wet month and rain is recorded on twenty days with a total of 9·60 inches, or about 20 per cent greater than the average. This, with the warm weather, favoured the forage crops; roots especially made good growth during the month. The first fall frost of 1 degree was recorded on October 1. The only other frost recorded for the month was on the 23rd, when the temperature fell to 32 degrees. During the first week in November, frost occurred every night and 11 and 10 degrees were recorded on the 3rd and 4th respectively.

There was a short period of sleighing during Christmas week, and fair sleighing from the 19th to the 24th of January; again from the 15th to the end of February, and for a week in March. Brooks and streams thawed out early in March, but the weather remained cold and dull for the most part.

METEOROLOGICAL RECORDS.

MONTH.	TEMPERATURE F.			PRECIPITATION.			Total Sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	
1913.	°	°	°	Inches.	Inches.	Inches.	Hours.
April	41·9	77	19	4·29		4·29	137·1
May	46·2	70	27	3·17		3·17	178·2
June	56·7	78	33	1·23		1·23	270·1
July	65·4	87	44	3·72		3·72	252·1
August	63·3	86	36	1·70		1·70	238·4
September	54·3	84	35	2·55		2·55	156·6
October	56·5	74	31	9·60		9·60	57·8
November	38·4	65	21	1·97		1·97	111·5
December	23·44	55	6	3·02	13·75	4·39	74·65
1914.							
January	19·68	53	5 below	1·18	16·25	2·80	91·6
February	14·19	43	17 below	·79	18	2·59	118·7
March	30·72	50	11	3·13	6	3·73	118·2
Total for year				36·35	54·00	41·74	1,804·95

CROPS GROWN.

Thirteen acres were planted to potatoes. Nine acres were sown besides the experimental plots, but the yield per acre was only 117⅓ bushels, the light crop being due to the dry weather and the poor land on which they were grown. Ten acres of corn planted gave 82 tons of ensilage for the silo. It was fairly well matured when cut. Ten acres of oats averaged 38·6 bushels per acre. Other than the turnip test plots there were 4 acres in turnips which yielded 2,362 bushels. One-half of these were grown on a piece of land that had been cleared of green stumps the previous season, and commercial fertilizers only were used. The soil was very poor and light.

The hay crop was small owing to the area in grass being limited, consisting of 8 acres of dyke land and 3 acres in the ravine south of the main road; 23 tons were harvested. Fifteen acres were sown to buckwheat and ploughed under on the newly-broken land.

FRUITS PLANTED.

Two trees each of 314 varieties of apples, pears, cherries, peaches, plums, quinces and apricots were planted. In addition to this, several larger experimental blocks were set to apples, plums, cherries and pears, making a total of 1,590 trees planted, consisting of 800 apple, 336 plum, 16 pear, 134 cherry, 75 peach, 10 apricot and 10 quince. There are 33 acres now planted with young fruit trees. Thirty-one varieties of grapes, nine of gooseberries, thirty of currants, sixteen of blackberries, eight of raspberries, ten of strawberries, making a total of 1,972 plants of small fruits, were set. The fruits have, with a few exceptions, made good growth.

LAWNS AND PLANTING OF SHRUBS AND TREES.

About five acres around the buildings at the front of the farm are too rough and broken to be of any value except for ornamental purposes; accordingly this has been graded and planted in part with shrubs and trees. This area is very poor and owing to the dry season the grass made a very feeble start, but gained somewhat at the end of the season with the favourable fall rains. The shrubs and trees have done well with the exception of the evergreens which were largely a failure and which it will be necessary to replant. An avenue of sugar maples planted along the principal road through the centre of the farm has made an excellent growth; a grass plot 10 feet wide has been left at each side of the road.

ROADS.

The roads have been greatly improved by grading where necessary and new roads have been constructed to the back of the farm. An approach was made to the ravine half-way toward the south end. This was difficult to construct owing to the abrupt character of the bank and to the fact that the sandstone lies near the surface, which made it necessary to do considerable blasting with dynamite.

FENCING.

Nearly 2½ miles of fence were constructed around the farm. Cedar posts were set a rod apart and wire was used. The east fence was particularly difficult to construct owing to the rough nature of the land along the upper edge of the ravine, and also because of rock near the surface, which had to be blasted.

CLEARING LAND.

In addition to freeing land, already broken, of roots and stone, 17 acres in green stumps were cleared and ploughed. This land for the most part is covered with hardwood stumps and large hemlock and spruce stumps. The hardwood has made a thick sprout growth which keeps the roots green and renders the task of clearing doubly difficult. It is necessary to use considerable dynamite, and hand stumping machines are also employed. An effort was made to have the work, or part of it at least, done by contract, but no one could be got to undertake it. The large-size Manitoba brush breaker is used to plough the land, and three pair of oxen are necessary to break the thick network of roots. One 10-acre area cost $218.75 per acre. The other seven acres cost $282.40 per acre.

Ten acres were brushed over during the summer at a cost of $20 per acre. This will be burned over next spring and it is thought that by cutting in the summer and burning it about the middle of June, the stumps will not make sprout growth and will rot rather than remain alive as at present on the acres being cleared.

DYKING.

Dykes to the extent of 2,525 feet were constructed around the marsh area during the summer. It is proposed to put the 8 acres enclosed by this dyke into good shape next season by draining and ploughing.

OVERFLOW WATER.

Since the areas at the rear have been cleared up, trouble is caused in the spring and after much rain by the heavy flow of water from the fields which damages the crops and carries the top soil from the upper to the lower areas. Three hundred feet of 15-inch drain was put in at one point to carry off this water, and much time has been spent in constructing surface stone drains and catch basins. It is hoped that these may in part overcome this trouble.

APIARY.

An apiary has been started and four colonies of black bees were carried over the winter.

BUILDINGS CONSTRUCTED.

An ice-house 16 by 20 feet was put up during the summer. Seven poultry colony houses 8 by 12 feet each were also built. A building 8 by 12 feet was erected near the apiary for apiary supplies and a workroom.

STOCK.

In addition to the six working horses and one driver, three pair of oxen are kept during the summer for breaking land. The ox teams are better than horses for this work as they are much more steady on the uneven ground. Eleven Shorthorn cows and one bull were purchased; four have given heifer calves and one a bull calf. This stock is all in excellent condition. Eighteen steers were bought in November at a cost of 5¾ cents per pound, live weight, and were sold the last of March at 7¼ cents per pound live weight. They weighed at the start 18,905 pounds, and, when sold, 22,910 pounds, a total gain of 4,005 pounds.

EXPERIMENTAL ORCHARDS.

Experimental orchard work has been conducted at Falmouth, Hants county; Berwick, Kings county; and Bridgetown, Annapolis county. The object is to determine what materials are best for the control of orchard insects and diseases, and the most profitable for the fruit grower. The time and method of application and problems relating to cultivation and fertilization are being studied at these stations. The work of Berwick and Falmouth has, during the past season, been in the charge of Mr. J. M. Robinson, B.S.A., assistant at the Kentville Station, and at Bridgetown, Mr. M. B. Davis, B.S.A. has had charge. The work so far proves conclusively that even in seasons favourable for scab development, such as the one just past, thorough applications in season of lime sulphur or Bordeaux will give practically clean fruit. Experiments in thinning of fruit have also been conducted and much data of value secured.

FERTILIZER EXPERIMENTS.

A series of fertilizer experiments combining orchard trees and agricultural crops between the trees in the young orchards was started. The crop during the past season was potatoes, which will be followed with grain seeded to clover.

EXPERIMENTS IN GREENHOUSE.

The greenhouse was used during the winter to conduct soil tests with various fertilizers, and tomatoes, lettuce and spinach were the principal crops grown.

CEREAL PLOTS.

Two plots, each of one-quarter acre, of Daubeney and Banner oats, Canadian Thorpe and Manchurian barley, Red Fife and Marquis wheat were sown. These made fair growth, but the ground came up thick with buckwheat from a crop turned down late the fall previous, and, as a result, the returns were not of a reliable nature. One bushel of each of these has been hand-picked for seeding in the spring.

FLOWERS AND VEGETABLES.

Tests were made of fifty varieties of potatoes, and 200 varieties of vegetables. All of the principal annual flowering plants were grown in many varieties, and seeds of fifty-five perennial flowering plants were started in shaded frames and will be permanently set in the perennial border next spring.

MEETINGS ATTENDED.

Addresses were given by the Superintendent at a series of meetings in Kings and Annapolis counties early in April, 1913, and in February and March, 1914. On August 27 and 28, lawns and flowers were judged for the Prince Edward Island Floral Exhibition, Charlottetown, P.E.I. Fruit was judged at the Nova Scotia Provincial Exhibition, Halifax, N.S., September 3 and 4; Hants, Kings and Annapolis Exhibition, Windsor, N.S., October 8 and 9; Cumberland County Exhibition, Parrsboro, N.S., October 16; and Maritime Winter Fair, December 9.

Meetings of the Nova Scotia Fruit Growers, Kentville, N.S., January 20 and 25; Maritime Winter Fair, Amherst, N.S., December 10; Nova Scotia Farmers' Association, Bridgewater, January 29; Dartmouth Agricultural Society, February 13, were also addressed. A series of five lectures in fruit culture was delivered to the students in attendance at the Nova Scotia Agricultural College, Truro, N.S., during February and March.

The New England apple show, Boston, was attended November 14, and also the meetings of the American Pomological Society and Society for the Promotion of Horticultural Science, November 15 to 20.

The Assistant, Mr. Robinson, also addressed a series of meetings in Kings and Annapolis counties during March and April.

EXPERIMENTAL STATION FOR NEW BRUNSWICK.

FREDERICTON, N.B.

This Station, the establishment of which in October, 1912, was noted in the report for that year, has been developed during 1913, until now there are good barns built, and good progress has been made in clearing land, fencing and draining. As there was only a comparatively small portion of the area of the station land cleared and most of this cleared land was so weedy as to be unfit for research work, but little experimental work was undertaken this year.

The weather conditions were somewhat abnormal during the season. Following a winter milder and with much less snow than the average, April was cool with a very few warm days. May was both wet and cold, and June was also wet. As much of the land was very wet naturally, this weather made it almost impossible to get any crop in the ground early. On the sod ground where it was desired to put grain, no ploughing could be done till the first of June. Rain continued until July 15, and there was but little warmth. From the 15th July till the 1st October sufficient rain fell to keep all crops growing well, but the weather might be classed as dry. Through October, the total precipitation showed 7·4 inches for the month, while 4·8 inches is the average for the last thirty-nine years. The wet weather was so continuous as seriously to interfere with all harvesting operations, and a great deal of late grain throughout the southern part of the province was spoiled, as well as serious damage done to the potato crop.

There was a good deal of frost through May, and on the 23rd June there was quite a heavy frost on the lower-lying parts of the farm. The first frost again noticed on the farm was on the 16th September, which just touched some tender plants, and there was no more till the 28th September, when most of the potatoes were blackened and the upper part of the corn plants whitened. There was no further frost till the 21st October, and there were only three days on which the sun shone in that period. The balance of the month was much brighter, though the precipitation in the ten days was 2·25 inches. There was 4 degrees of frost on the 31st, 10 degrees on the 1st November, and 17 degrees frost on the 2nd. This cold spell froze a great many potatoes in the fields and in transit.

Throughout November the weather was delightfully mild and bright, the rainfall for that month only totalling 1·14 inches.

RECORD OF TEMPERATURE, Precipitation and Sunshine at Fredericton for the year 1913.

MONTHS.	TEMPERATURES.			Precipitation.	Hours of Bright Sunshine.
	Highest.	Lowest.	Mean.		
1913.	°	°	°	Inches.	
April	83	15	42	2·2	160
May	83	27	47	4·0	181
June	83	34	58	1·9	257
July	91	47	64	5·1	213
August	87	36	63	4·0	244
September	85	29	55	2·1	192
October	76	26	53	7·4	57
November	62	4	36	1·5	107
December	47	−13	24	2·7	112
1914.					
January	51	−11	22	4·1	81
February	38	−20	12	2·9	123
March	60	−9	30	6·0	124
Total				43·9	1,851

BUILDINGS.

Two houses already on the place were repaired. One was fitted up for the use of the Superintendent until a residence can be built, and one for the foreman. A herdsman's house was also erected, a well drilled for water supply, and a house built over it, and pumping machinery, a pneumatic tank and air compressor installed. The various houses and barns were connected with the tank by service pipes.

A main cattle barn 50 by 100 feet, a dairy barn connected to it, 41 by 102 feet, together to house 100 head of cattle, a horse barn 30 by 90 feet, and a dairy building with cold storage attached, were erected, the cattle barn being occupied in January and the other buildings at the end of the fiscal year.

FENCING AND DRAINING.

Between 2 and 3 miles of woven wire fencing was erected, and 17 acres of land tile drained as well as over half a mile of heavy open ditch dug.

CLEARING LAND.

One hundred and fifty acres were cut over, wood removed, brush burned, small bushes cut and approximately 50 acres stumped and ploughed.

ROADMAKING.

Four thousand and thirty feet of farm road was constructed with stone foundation and gravel surface through the centre of the farm, connecting the highway on the river bank with Doak station on the Canadian Pacific railway, and the high-

way across the front of the station land was turnpiked, stone-filled in places and all gravelled. A half mile of road ditch was dug along the Wilsey road where it passes through the Station.

LIVE STOCK.

Seven draught mares, two draught geldings ranging in weight from 1,530 to 1,900 pounds, and one driving mare were purchased, making with the four grade Clyde mares already on the farm, six two-horse teams and one horse for single farm work. Eight mares were bred, but only four have proved pregnant.

Two grade cows were purchased and their milk sold to families of officers and men working on the Station.

During the winter thirty-nine cattle were bought for feeding. Feeders were very high at time of purchase and the quality of those available very poor. They will be carried along for the early summer market.

POULTRY.

Three small flocks of Rhode Island Reds, Barred Plymouth Rocks and White Wyandottes were started. Ninety-four chickens were raised and the best kept to make up three laying flocks which were wintered in colony houses. Preparations were made to conduct poultry work on a more extensive scale in 1914.

CROPS.

Six and one-seventh acres of potatoes, twelve and a half acres of Indian corn and five acres of turnips comprised the field hoed crops. As the drier land on the farm was so full of mustard, only one and a quarter acres of oats were sown there. To pull the mustard from this cost $36. The yield was 60 bushels. Some oats and barley sown late on very wet land were a failure.

HORTICULTURE.

One and one-third acres of land were devoted to garden vegetables and flowers, etc., and twelve thousand shrubs, seedling trees, etc., were set in a nursery for future ornamental trees.

Tests were made of varieties of vegetables as to yield and characteristics and distance apart for thinning beets, carrots, etc.

POTATOES.

A variety test of 154 samples was made in rows of 66 hills each. Yields varied from 13 bushels per acre to 631 bushels, over forty varieties yielding at the rate of 400 bushels or over per acre.

Eighteen fertilizer plots to test different chemicals and combinations of chemicals were planted with potatoes. The average yield for the six and one-seventh acres, including plots where no fertilizer was used, was 288 bushels and 51 pounds per acre. The commercial plot of 1¾ acres yielded at the rate of 337 bushels and 25 pounds per acre.

Fifty-five pound samples of seed potatoes of Irish Cobbler, Green Mountain, Delaware and Carman varieties, were distributed to applicants in New Brunswick.

MEETINGS AND ADDRESSES.

The sessions of the Annual Meeting of the Farmers' and Dairymen's Association at Fredericton were attended by the Superintendent and an address given by him on the growing of Indian Corn for Silage, and the comparative results in food value from the crops of Indian corn and turnips per acre as grown at the Station.

Ten horses and four cattle were also furnished for the judging classes in connection with the same meeting.

Lectures on live stock feeding and the agricultural capabilities of New Brunswick were given before the Short Course students at the Agricultural School at Woodstock in March.

EXPERIMENTAL STATION FOR EASTERN QUEBEC.

St. Anne de La Pocatière, Que.

CHARACTER OF SEASON.

With the exception of 1912, the season of 1913 was probably the most unfavourable for field work and yield of crops experienced for many years.

The snowfall during the winter of 1912-13 was very light, but there was an exceptional amount of rain, and the soil was covered all winter with a heavy coat of ice. This damaged grass land very much, and the clover meadows were completely destroyed.

The ice and snow were practically all gone by March 22. April, though bright, was windy and cold. It was the driest month of the season, and at its close the soil was powdery on the surface while the subsoil was still frozen.

May opened warm and dry, but became colder on the 7th, continuing cold and rainy to the end of the month. This was very unfavourable to growth.

Temperatures in June were variable and there were frequent light rains. July was rainy and cool, most unfavourable weather for haying, which was in consequence delayed in this district until August, with the exception of the hay crop on the Experimental Station, which was saved in July.

August and September gave the best growing weather of the year and the grain crops were harvested in excellent condition.

October was rainy and cold. During the month, much of the grain in this district, which had been sown in June, was harvested. In a section like eastern Quebec, where the growing season is so short and the weather so uncertain, more attention to fall cultivation is very desirable. It would avoid, to a great extent, the late harvesting of the crops and would double the chance of profitable returns.

Fall work on the land was possible up to November 20. The first snow fell on December 7. January and February were marked by extremely cold weather and frequent snowfalls, though none of them was heavy. March was a cold month, although no extremely low temperatures were registered. The snow and ice disappeared during the last days of the month.

It might be stated that the snowfall in those parts of the counties of L'Islet and Kamouraska bordering on the river and surrounding the Experimental Station is lighter than in other sections in the same latitude. This is probably caused by the low altitude and the proximity of the St. Lawrence.

ENLARGEMENT OF THE STATION.

One hundred and twenty-five arpents of land were added to the Station in the fall of 1913.

LINES OF WORK.

Twelve head of Ayrshires were sent to the Station from the Central Experimental Farm at Ottawa. These will form the nucleus of a herd.

A boar and two sows of the Yorkshire breed were received from the Experimental Station, Cap Rouge, Que. These will serve as foundation breeding stock, and it is hoped to give the work with swine a prominent place in the programme of the Station.

Six colonies of bees were purchased to start an apiary. The results of the season, both in honey and in new colonies, were excellent. The district around Ste. Anne de la Pocatière should prove suitable for apiculture, and the demand for honey is good, although few farmers keep bees. It is hoped to enlarge the scope of this work, taking up both the commercial and the experimental sides of bee-keeping.

Poultry work will be commenced as soon as the poultry buildings can be erected.

IMPROVEMENTS MADE.

This work has taken up most of the time and attention during the year.

Over nine thousand feet of drain tile have been laid. This drainage work has already proved its utility and value. Larger drains have been laid from the barn yards and mains to carry off the water from the laterals.

Some one thousand loads of stone have been gathered from the fields and most of it used in the construction of foundations of the farm buildings.

NEW BUILDINGS.

A cow barn and a horse barn have been built during the year. These have been erected and fitted up in the most modern way, pleasing appearance being united as far as possible to convenience of interior arrangement, ventilation, light, ease of access and economy of construction.

METEOROLOGICAL RECORDS.

Months.	Temperature F.					Precipitation.			Sunshine.
	Date.	Maximum.	Date.	Minimum.	Mean.	Rain. Inches.	Snow. Inches.	Total. Inches.	Hours.
1913.									
April	25	82·2	8	8·6	39·4	·12	6	·72	200·6
May	6	87·8	7	22·0	49·2	2·69		2·69	187·7
June	27	82·2	22	33·8	57·9	1·53		1·53	241·5
July	1	83·2	30	44·0	63·4	3·64		3·64	226·8
August	16	81·2	25	39·2	62·4	1·34		1·34	246·8
September	7	81·8	13	33·2	54·3	2·81		2·91	199·8
October	8	75·4	31	24·2	47·5	3·42		3·42	80·2
November	8	63·2	27	3·8	36·5	·77		·77	89·9
December	9	32·2	31	−20·0	17·2	·13	10	1·13	66·8
1914.									
January	28	38·4	13	−30·6	12·9	·30	19	2·10	92·2
February	28	36·2	11	−32·6	5·9		13	1·30	104·3
March	17	47·0	12	− 3·0	24·4	·08	12	1·28	139·8
Total						16·83	60	22·83	1,876·4

EXPERIMENTAL STATION FOR CENTRAL QUEBEC.
CAP ROUGE, QUE.

CHARACTER OF SEASON.

For the farmer of central Quebec, 1913 was a very good year. The spring was exceedingly early and the only drawback was the drought which lasted throughout August. Those who sowed early, cultivated their hoed crops well, and attended to their work in time, did not suffer materially from this dry period.

Hay.—The mild winter of 1912-13 left bare many meadows and pastures, and there was not much clover. Still, the crop of hay was a fair one, due to the splendid growing weather of June. At the Station, it averaged over two tons per acre.

Grain.—The crop of grain was the heaviest seen in central Quebec for years. There was just enough precipitation to hasten germination, also to force vegetation, and all which was sown before May 15 escaped the bad effects of the drought of August. At the Station, oats for the trial plots were put in on the last two days of April; the main crop averaged over 78 bushels per acre.

Corn.—The drought of August was detrimental to Indian corn, and a rather early frost, on the night of September 14, cut down the yield in tons.

Roots.—Though momentarily stopped by the dry weather of August, roots recuperated under the beneficial effects of the cool nights of September and October.

Fruit.—The temperature was just right for fruit, with the exception of a frost during the middle of May. This hurt the early flowering trees.

Vegetables.—The season was as good as could be wished for. Vegetables and peppers, as well as egg plants, matured their fruit for the first time at this Station. A lot of tomato seed was saved, which shows that temperatures were favourable.

Flowers.—There was enough heat and precipitation, at the right time, for flowers.

LIVE STOCK.

All the live stock did well during the year.

Horses.—There are now seventeen horses at the Station: twelve French Canadians—nine mares, two yearling fillies, one colt; two teams of from 2,600 to 2,900 pounds weight, and a driver of about 1,000 pounds.

Experiment—Wintering a horse at low cost.—This experiment was continued for the third year.

Cost of raising horses.—Very few people have an idea of what it costs to raise a horse until he is fit to work or to sell. To throw light on this subject, it is intended to weigh the feed given to young animals. A colt dropped on May 31, 1913, had eaten food amounting to $27.51 by April 1, 1914. On the latter date, when he was ten months old, he weighed 735 pounds. The average weight of the sire and dam of this weanling is about 1,075 pounds.

Dairy cattle.—The herd now comprises fifty-three head of pure-bred and grade French Canadians. There are one aged and three yearling bulls, twenty-seven cows, nine yearling heifers and thirteen calves. Out of this number, there are sixteen grade cows and heifers. These grades are kept to see if a profitable herd can be developed from them by using pure-bred bulls as sires. The profits given by eighteen cows which completed a lactation period during the year, were from $107.10 down to $24.22, neglecting the labour item.

Sheep.—There are on the Station, one ram, six breeding ewes, and eight ewe lambs, all pure-bred Leicesters. The flock is small, but the individuals very good, having character and weight. No experiment has been started yet on account of lack of accommodation. Twelve fine lambs were raised from six ewes, four rams bringing over $40 each at the public sale held during October at Quebec.

Swine.—There are only three pure-bred Yorkshire sows. The piggery was used for horses during the erection of a new barn and there was no room for hogs. A boar bred at this Station made the highest price at the auction sale of the Provincial Government, at Quebec, in the fall of 1913.

Poultry.—A small beginning has been made in poultry keeping.

Bees.—Ten colonies were bought on June 20, a little too late for best results. The average production of honey was 31·9 pounds, and eleven colonies were put, on November 10, in a cellar especially fixed for them.

FIELD HUSBANDRY.

Yield of crops under field conditions.—The following table shows that, in 1913, swedes gave by far the most digestible dry matter per acre.

Kind of crop.	Variety.	Yield.	Digestible dry matter per acre.
Swedes	Good Luck	39,290 lb. or 654 bush. 50 lb.	3,654 lb.
Corn	Longfellow	14,524 lb. or 7 tons 524 lb.	2,367 lb.
Carrots	White Belgian	26,699 lb. or 444 bush. 59 lb.	2,350 lb.
Hay	Timothy and clover	4,118 lb. or 2 tons 118 lb.	1,919 lb.
Oats	Banner	2,659 lb. or 78 bush. 7 lb.	1,723 lb.

Cost of production of crops.—The exact cost of production was kept for 18 acres of swedes, oats and hay, with the following results:—

Kind of Crop.	Cost of 1 ton.	Cost of 1 bushel.	Cost of 100 pounds digestible dry matter.
Swedes	$1·94		$1·04
Oats		$0·31	1·40
Hay (timothy and clover	3·86		·41

As the crop of clover was an exceedingly large one, it is probable that, for an average number of years, the cost to produce 100 pounds digestible dry matter in hay would be much higher than it was this year.

Rotations.—One 3, one 4 and one 6-year rotation have been compared for profit since 1911 inclusive. It is yet too early to give definite results, but the following table shows that it is advantageous to rotate crops:—

	3-year rotation.	4-year rotation.	6-year rotation.
Value per acre, 1913	$28·06	$23·14	$22·51
Value per acre, 1911	16·80	12·67	15·58
Increase in 3 years	$11·26	$10·47	$6·93
Percentage of increase	67	83	31

Rates of seeding corn for silage.—All the corn grown for silage for three years has been weighed, and the following figures are interesting:—

In rows 42 inches apart, plants 8 inches in row, 9 tons 1,094 pounds per acre.
In rows 48 inches apart, plants 8 inches in row, 8 tons 1,754 pounds per acre.
In hills 36 inches in every direction, 5 tons 1,398 pounds per acre.
In hills 42 inches in every direction, 5 tons 1,364 pounds per acre.

VARIETY TESTS.

The trial plots are now permanently located on a piece of uniform soil where a three-year rotation is used: Roots and Indian corn for the Agrostologist, grain for the Cerealist, and hay for the experiment with different quantities of seed and to find the best nurse crop.

Roots.—Fourteen varieties of turnips (swedes), eleven of mangels, three of sugar beets, and six of carrots were tried on duplicate plots of one-fiftieth acre each. There were two check rows at the ends and also between each kind of root, so that no variety had more room or light than any other one.

Indian corn.—The three best yielding varieties for silage were, this year: Ninety Day, Salzer's North Dakota, and White Cap Yellow Dent.

Cereals.—Fourteen varieties of spring wheat, four of 2-row barley, seven of 6-row barley, ten of oats, and six of peas were sown on one-sixtieth acre plots.

Vegetables.—Three hundred and sixty-four varieties of vegetables were tested in 1913.

Seed growing.—We have grown seed from many varieties of beans, corn, cucumber, lettuce, musk melon, peas, peppers, radish, squash, tomatoes, water melon, and there seems to be no reason why we cannot grow seed of nearly all the vegetables used in this district.

Ornamental gardening.—Twenty-five varieties of conifers, 109 of deciduous trees and shrubs, 47 of roses, and over 600 of perennials, annuals and bulbs were grown in 1913, and notes were taken of each variety. We distributed over 1,400 packages of seed and as many plants of perennials. At Quebec Exhibition, we made a display of flowers and were awarded a diploma and gold medal for same.

IMPROVEMENTS.

Clearing of land.—About 15 acres were stumped and ploughed during 1913 ready to put under crop in 1914.

Drainage.—Over 32,000 feet or more than 6 miles in length, of tiles were laid in 1913. Nothing smaller than 3-inch is used, as it has been found that the 2-inch will clog very easily. The ditching machine was used, and with a careful man to run it better work can be done with it than by hand.

Horse barn.—What is probably the best horse barn in Eastern Canada was built during the autumn and early winter. It is 102 feet by 32 feet with an L 26 feet by 20 feet. The foundations and floor are concrete, it has a plank frame, and the roof is metal. There are sixteen tie and eight box-stalls, with different floorings of clay, cork, brick, wood and concrete to see which suits our conditions best. The system of ventilation is the Rutherford. Hay is brought down to each manger in chutes, whilst bedding comes through the ventilating shafts. There are twenty-eight windows, and those of the ground floor are placed at 7 feet, so that whilst the stable is very well lighted, there is no direct glare to hurt the horses' eyes. A hay fork serves to bring in the hay, and a carrier to take out manure. There is a good harness room, a feed room, and a granary above these.

With nine paddocks of from one to one and a half acres each having a neat, well-painted shed, and a stud of the best French Canadian mares which could be

bought, we have what may be considered one of the best horse-breeding plants in Quebec.

SOME WEATHER OBSERVATIONS taken at Cap Rouge Experimental Station, 1913-1914.

	Temperature F.			Precipitation.				Total Sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	Heaviest in 24 hrs.	
				Inches.	Inches.	Inches.	Inches.	Hours.
1913.								
April	39·35	83	15·2	2·14	1·2	2·26	·83	199·8
May	48·95	85	25·2	3·27		3·27	1·05	207·4
June	57·30	84	36·2	2·53		2·53	·68	233·7
July	65·19	88	45·2	5·36		5·36	1·22	215·4
August	61·58	83	40·2	1·97		1·97	·58	230·7
September	56·60	82	28·2	4·01		4·01	1·95	209·3
October	48·96	73	24·2	4·11		4·11	·81	76·3
November	33·42	61	13·2	1·75	2·6	2·01	·88	61·1
December	21·23	37	− 1·1	·40	29·5	3·35	·80	43·4
1914.								
January	7·07	43	−24·8	·03	34·0	3·43	·60	57·5
February	·84	33	−30·7		32·6	3·26	·80	106·1
March	23·70	45	− 2·1	·35	26·3	2·98	·70	125·4
Total for year				25·92	126·2	38·54	....	1,766·1
Average for two years				33·18	131·2	46·30	.....	1,593·7
Total for six months, May to October				21·25		21·25	.....	1,172·8
Average of two years for six growing months, May to October				24·77	.....	24·77	.....	1,059·8

EXPERIMENTAL FARM FOR MANITOBA.

BRANDON, MAN.

WEATHER CONDITIONS.

The spring of 1913 opened up with favourable weather. Winter had continued late, but when warm weather came, the change was rapid. Seeding began on April 16. On the higher parts of the Farm, conditions for seeding were ideal, and it was finished early. About two hundred acres of the land along the Assiniboine river were flooded for most of the month of May, and, as a result, seeding was late and crops unsatisfactory.

The weather was very dry for the growing part of the season, the total rainfall up to the end of July being only 5·53 inches. This affected the crops on the unflooded land and prevented yields from being as heavy as are expected in a normal season.

August was a month of moderate rainfall. The autumn months were dry and the winter snowfall was light. The total precipitation for the year was less than 13 inches.

TESTS OF CEREALS.

Duplicate plots were used in the testing of varieties of grain this year, in order that the possibility of error might be lessened. Four named varieties of wheat were tested and also ten new varieties produced by the Dominion Cerealist, and known by numbers only, were given a trial. Marquis as usual gave the best results: Red Fife also showed its value for Manitoba. None of the new varieties was at all

a serious contender against these two. Of the seventeen varieties of oats tested this year, Banner was found to be the most satisfactory for general use. Ten varieties of six-row barley and seven of two-row were tested. The six-row varieties are the better for Manitoba, and of these Manchurian and O.A.C. No. 21 are recommended. Of ten varieties of field peas, Mackay is the heaviest yielder, and Arthur the earliest.

CULTURAL WORK.

The extensive system of cultural experiments inaugurated in 1911 has been continued according to the detailed plan decided upon. A great mass of figures giving yields obtained under different treatments is being gathered. It is rather early as yet for definite results from this work, but in the course of a few years more, some valuable information should be available on the different questions which are being investigated.

The experiments with rotations made rather poor progress on account of the overflowing of the Assiniboine river. Most of the land that is used for the rotations is on the lower portions of the Farm. The flood made such unusual conditions on these fields that the season's results are not of much value.

FORAGE CROPS.

Experiments with different varieties of grasses, clovers, alfalfa and mixtures of the same, gave interesting results. Alfalfa shows itself to be decidedly the most productive hay crop, no matter whether alone or in mixtures. Western Rye grass also gave very good results. Notes taken on plots of grass and clover mixtures showed that alfalfa and Western Rye grass were dominant and gradually increased their proportion of the crop.

Field crops of hay were heavy on the flooded land, but rather below average on the higher part of the Farm.

Thirteen varieties of fodder corn, twenty-two varieties of turnips, eleven varieties of mangels, three varieties of sugar beets and nine varieties of carrots were included in the tests of field roots. The dry weather affected the crop of roots and it was hardly up to average.

HORTICULTURE.

Twenty-eight varieties of potatoes were tested in uniform test rows, and were also subjected to a cooking test. A test of fertilizers applied to potatoes was also made. The usual tests of varieties of all the kinds of garden vegetables were made. Notes were taken on the appearance and table quality of these vegetables as well as on the yield and date of being ready for use.

The usual display of flowers was made, and was greatly admired by many visitors. Tulips planted in the previous fall made an especially fine showing in the spring of 1913.

Numerous sorts of trees and shrubs continue to thrive on the grounds around the Superintendent's house. Notes were taken on the growth and comparative hardiness of each.

A large crop of plums was harvested from the native Manitoba plum trees, some of which produced fruit of very good quality. Smaller quantities of Cheney, Aitken and other named varieties were also produced.

The 3,000 young seedlings of standard apples which were set out the previous year have done very well. Nearly all have wintered well and are alive to the tip.

LIVE STOCK.

The milking Shorthorn cows have done better than in previous years. One cow made a record of 11,334 pounds of milk in one yielding period. Records are being kept of the amount of feed consumed by each animal every day, and information will be available on the cost of milk production and the cost of raising calves and heifers.

An experiment in feeding steers out-of-doors was completed in the spring of 1913. In the fall an experiment was started in which dry corn fodder cured in stooks is compared with ensilage as a feed for fattening steers. The lot fed ensilage are making decidedly the better gains.

The flock of breeding ewes was used for an experiment in wintering sheep. One lot was fed in an open shed and one lot in a good barn; the ones in the shed wintered equally as well as the others. A comparison was also made between grass hay and alfalfa as a winter feed for breeding ewes, with results in favour of alfalfa. Data on the cost of feeding sheep are also being collected.

Experiments in feeding pigs showed that barley had a slight advantage over oats as a winter feed for half-grown pigs and that both were decidedly preferable to shorts. Feeding three times a day showed no advantage over twice a day for pigs of one to two hundred pounds weight. The breeding sows were increased in number and reasonably good success was attained in raising young pigs.

POULTRY AND BEES.

A man with special training in these two lines of work was engaged and began work in May, 1913. The flock of Barred Rocks was increased, and a small flock of White Wyandottes was obtained. Experimental work with cotton front colony houses showed that this type of building is quite satisfactory in this climate.

The season was not very favourable for bees as the amount of bloom was below average. However, a fair amount of honey was produced and the number of colonies doubled.

BUILDINGS.

A new horse barn was built this season, and is found to be very satisfactory. It will allow more room for cattle in the old building. A new piggery 82 feet long was also constructed. It is a good example of the best and most modern ideas in piggery construction.

Six colony houses for poultry were also built. Variations in construction were used in order to find out the best type.

A new office, 20 feet by 30 feet in size, has been built and is found to be a great help in handling the ever-growing office work in connection with the Farm.

A cottage for the herdsman was also erected and fills a much-felt want.

EXHIBITIONS.

Exhibits showing the products of the Experimental Farm, and illustrating some of the lines of experimental work being followed were made at the Dominion Fair at Brandon in July, 1913, and at the annual exhibition of the Brandon Horticultural Society in August, 1913.

MEETINGS.

The Superintendent addressed farmers' meetings at the following points in Manitoba: Deloraine, Cartwright, Morden, Manitou, Fannystelle, Culross, St. Claude, Rathwell, Cypress River, Treesbank, Methven, Carroll, Douglas, Sidney and Macgregor; judged seed fairs at the first four points above named; acted as judge

at the Manitoba Provincial Seed Fair at Winnipeg, and at the Hartney Ploughing Match.

The Assistant Superintendent addressed farmers' meetings at the following points in Manitoba: Hartney, Neepawa, Lyleton, Waskada, Whitewater, Ninga, Killarney, Cartwright, Crystal City, Lariviere, Darlingford, Morden, Plum Coulee, Rosenfeld, Kirkella, McAuley, Macdonald, Keyes, Arden, Franklin and Newdale; and judged seed fairs at the first two above named.

A wide range of agricultural topics was covered in the subjects taken up at these meetings. Among the subjects most frequently discussed were the following: 'The Work of the Experimental Farms,' 'Rotation of Crops,' 'Corn Growing in Manitoba,' 'Alfalfa Growing,' 'Mixed Farming.'

DISTRIBUTION.

During the year the following distribution was made: 392 samples of potatoes, 1 bundle of Manitoba maples, 2,200 pounds of inoculated soil for alfalfa, 500 pounds of inoculated soil for red clover.

VISITORS.

The number of visitors who inspected the Farm during the year was approximately 11,000.

Meteorological Records.

Months.	Highest Temperature.	Lowest Temperature.	Total Rainfall.	Total. Snowfall.	Hours Bright Sunshine.
1913.	°	°	Inches.	Inches.	
April	82·7	18·1	·25	1	226·4
May	88	18	1·04	.....	199·8
June	90	32	2·34	.....	218·8
July	95·3	41	1·70	.....	228·8
August	94	41	3·56	.....	235·6
September	87·3	23	·68	.....	199·1
October	81·3	− 3	·73	.....	137·5
November	59·7	− 3	·04	3	93·1
December	41·1	−19·8	.....	1	112·2
1914.					
January	38	−37·6	.....	16	73·5
February	37·9	−46·4	.....	3	134·2
March	44·9	−20·8	.....	1	114
	.....	.....	10·34	25	1973

Reckoning 10 inches of snowfall as equivalent to 1 inch of rainfall, the total precipitation for the year ending March 31, 1914, was 12·84 inches.

EXPERIMENTAL FARM FOR SOUTHERN SASKATCHEWAN.

Indian Head, Sask.

WEATHER CONDITIONS.

On the whole, the weather conditions during the summer of 1913 were excellent for both cereal and fodder crops. Seeding commenced about the 15th of April, and the latter part of April and the first part of May were comparatively dry, which facilitated early sowing.

During the growing period of June and July, 8.3 inches of rain fell, resulting in a luxuriant growth of stem and leaf. A large crop of hay was harvested, but was somewhat difficult to cure because of the rains during July. The cereal crop ripened comparatively early and was all harvested before any frost appeared. The winter of 1913-14 was comparatively mild and stock wintered outside in good condition.

INVESTIGATIONS IN PROGRESS.

Cereals.—Four named varieties of wheat were tested on the Farm in 1913. Of the named sorts the Marquis and Red Fife seem best adapted to the climatic and soil conditions of southern Saskatchewan. The Prelude, while maturing much earlier than either of these sorts, seems unlikely to become a commercial wheat in this portion of the province because of its inferior yield.

Of twelve varieties of oats, the Banner seems to give best results. This is very noticeable when the average for five or ten years is taken. It yields high and produces an oat of good quality both for milling and feed. Another promising sort is the Victory. This has not been under test long enough, however, to enable its being recommended as highly as the Banner.

Among the six-row barley, Manchurian and O.A.C. No. 21 are the highest yielders and among the earliest maturers.

The two-row sorts are not giving as good result as are the six. They are usually weaker in the straw and do not yield so well.

It is only recently that varieties of flax have been been isolated, but last season there were about ten varieties tested and among these the Premost was both the highest yielder and the earliest maturer.

In the introduction of peas in the west, early maturity is one of the most important points. For this reason, the Arthur pea is recommended. Another promising sort is the Solo. The Solo is an importation from Sweden and has not been under test long enough for final conclusion as to its value.

Forage crops.—Of the forage crops, grass is one of the most important. The results of a test made with different sorts on this Farm seem to indicate that, for hay, Western rye will give best results in this district. Brome is an excellent pasture grass but has two objections. The first is, it is hard to eradicate when the land is broken up, and the second is that it has a tendency to spread into adjoining fields and especially into hedges and windbreaks where it will eventually kill out the trees. This is more noticeable on heavy soils and where precipitation is over twenty inches per annum. Where these conditions prevail English Blue grass will make a good substitute.

The clovers are not well adapted to the light rainfalls of southern Saskatchewan. Among the different kinds, the common red clover seems to give best results.

Alfalfa is probably the best suited to western conditions of any of the legumes. It is drouth-resistant and if northern grown sorts are obtained, it proves to be perfectly hardy. Among the sorts giving best results on the Indian Head Farm are the Grimm and the Baltic.

Fodder corn is a crop that should not be neglected on any stock farm. It gives a large yield of succulent fodder. Last season a large quantity of corn ensilage was fed on this Farm and proved very valuable for both milch cows and fattening steers. Among the varieties best adapted to conditions here are Northwestern Dent and Longfellow. The former is usually the better because of its early-maturing character.

Varieties of turnips, mangels, sugar beets and carrots are grown each season on this Farm. In all about five acres of land is devoted to the purpose, as a large quantity of roots is required for winter feeding. Swedes are proving very satisfactory for conditions here.

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Avenue leading to Barns, Indian Head, Sask.

Horticulture.—A large number of varieties of the different kinds of vegetables are being tested each season and as soon as they have been in the test for five years, the five-year average will be published.

Many sorts of perennial flowers prove hardy in the west. They possibly require less attention than any other flower and give a large bloom in the early season. They also give a magnificent bloom during August and part of September.

Annual flowers are planted in smaller beds and among these asters flowered profusely.

Some of the old orchards and hedges were cut out last season and the land prepared for lawns. These were sown in early July and a good stand of grass secured. The lawn grass was a mixture of Kentucky blue grass and White Dutch clover.

Besides the trees on the avenues and windbreaks, a comparatively large arboretum is maintained. Many of the plants being tried out are proving hardy while a few are evidently too tender for conditions in the West. Of the trees that are giving best results, the Manitoba maple and Green ash are proving most satisfactory. Of the conifers some of the spruce and Scotch pine seem to be quite hardy. Among the flowering shrubs the caragana and lilac both produce an abundance of bloom early in the spring. In the orchards the crabs and hybrids gave a profusion of bloom and a heavy crop. These are proving perfectly hardy. Last year a shipment of two-year-old seedlings of those standard sorts proving to be hardy at Dunstan, Man., were received. Nearly all these lived through the winter.

A number of selected and hybrid sorts of plums were received from the South Dakota Agricultural College. These were planted and the Assiniboia, a selection of native plum, has proven most satisfactory.

A large number of the small fruits can be grown. Of these, the raspberry and currant seem most hardy.

Field Husbandry.—One of the most important lines of work under this head is the rotation tests. In this experiment, the object is not only to note the effect of each rotation on the fertility of the soil but also to find the cost of production of the various crops in each. The rotation that seems best suited to a mixed-farming district is one which includes: First year, summer-fallow; second year, wheat; third year, wheat; fourth year, oats seeded down; fifth year, hay; sixth year, pasture.

A large portion of the Farm is divided into small plots for the purpose of studying different methods of cultivation and crop management. Such questions as different systems of summer-fallowing, treating stubble, depth of ploughing, methods of harrowing, etc., are being studied.

Live Stock.—Until recently, horses were kept on the Farm for work only. The policy, however, is now changed and a start has been made to establish a stud of breeding mares.

At this Farm only Shorthorn cattle are kept. The herd has been handled until recently as a beef herd but as the demand of our farmers is for a dual-purpose cow the poor milkers are being culled out and a dual-purpose herd thus developed. With this end in view, a bull from a good milking strain was secured last fall. In addition to this work, steers are fattened on the Farm each winter. Last season twenty-eight steers were fed.

Shropshire sheep are kept on the Farm for the purpose of supplying breeding stock to farmers in the district, also to produce stock on which to calculate the cost of producing sheep in the West. In conjunction with this work, a flock of range ewes were bought some years ago and crossed with a pure-bred Shropshire ram, the idea being to see what improvement could be made in the mutton and wool qualities of range stock by the use of pure-bred top crosses. In the winter one hundred lambs were used in a feeding experiment. These were bought in the fall at 6½ cents a pound. They were divided into four lots of twenty-five each and fed

different rations. The ration that proved most economical was mixed hay, and oats and barley fed whole. No profit was made in this experiment because of the fact that the lambs were bought in the fall at a "lamb price" while they were sold in the spring with no margin at a "sheep price."

Two breeds of swine are kept at this Farm, namely, Yorkshire and Berkshire. No experimental work has been carried on with the exception of a test of wintering the sows in single-board cabins, outside, and in the piggery. The results from this test would seem to indicate that sows can be wintered to good advantage outside, one of the sows outside having already given birth to a small but very vigorous litter.

Poultry were only kept at this Farm in recent years for the purpose of supplying eggs and fowl for the table. In October, the Dominion Poultry Husbandman prepared plans of cotton-front houses. Three of these were built and eighty birds secured. These were wintered in the cotton-front houses and came through in fine condition. No freezing of combs or feet was noticed. This seems to indicate that poultry can be wintered in this type of house in southern Saskatchewan quite satisfactorily.

BUILDING.

During the year extensive building operations went on at this Farm. A new barn was built to take the place of the one burned in 1912. This is a excellent structure with a large loft overhead that will hold sufficient feed for one season. The stable proper is fitted with iron stanchions and will accommodate about seventy-five head of cattle and twenty horses in a wing of the main barn. At one end of the main barn there is a large milk room. At the other end there are three well-built bull pens. Along one side are three root houses, large enough to hold about 125 tons of roots.

Three cotton-front portable poultry houses were built in October. Two of these were 12 feet by 14 feet without a floor, large enough for forty birds each. The other was 10 feet by 12 feet with a floor. The idea in building this type of house was to ascertain the cheapest suitable house that could be used by farmers in this district.

In the fall a herdsman's cottage was built. It is 30 feet by 33 feet, with a small back kitchen 9 feet by 10 feet. It includes seven rooms, with an unfinished attic. It is a very pleasing little building of a style that could be used to good advantage by many of our farmers.

EXTENSION WORK.

Since his appointment in August, the Superintendent has found time to do considerable extension work. An address on cultivated grasses was given on October 22, at the Dry Farming Congress, Tulsa, Oklahoma. On December 15 he attended a farmers' convention at North Battleford under the auspices of the Agricultural Society and Board of Trade, delivering three lectures, one on Alfalfa Culture, one on the Problems on the Grain Farm and their Solution, and one on the Results Obtained in Field Husbandry on the Indian Head Experimental Farm.

He assisted in judging the grain at the provincial seed grain fairs at Saskatoon, Saskatchewan, and Winnipeg, Manitoba, and also at the inter-provincial seed grain fair and stock show at Brandon.

EXCURSIONS.

On July 24, an excursion was run to the Farm, including all towns on the main line from Moosejaw on the west to Moosomin on the east. A large number of people took advantage of the excursion and visited the Farm.

VISITORS.

The total number of visitors to the Farm during the year was about 2,655.

DISTRIBUTION OF SAMPLES.

While the distribution of all cereal samples is made from Ottawa, a large amount of potatoes, vegetable and flower seeds and tree and shrub seedlings and cuttings are distributed from this Farm to applicants in southern Saskatchewan each season. Last year the distribution amounted to: Potatoes, 1,266 packages; flower seeds, 184 packages; vegetable seeds, 144 packages; maple, ash and caragana seedlings, 1,247 packages, 75 in a bundle.

SALES OF SEED GRAIN.

Last year an endeavour was made to supply a large number of applicants with good seed grain. Wheat, oats, barley, flax and peas were sold in lots ranging from 1 bushel to 6 bushels, with the result that the following grain was sold: Wheat, 238½ bushels; oats, 47 bushels; barley, 96 bushels; flax, 14 bushels; peas, 30 bushels; fall rye, 35 bushels.

METEOROLOGICAL RECORDS.

Month.	Temperature F.					Rainfall.		Snowfall.	Sunshine
	Maximum.		Minimum.		Mean.				
1913.	Date.	°	Date.	°	°	Days.	Inches.	Inches.	Hours.
April	14	80	25	12	42·63	1	·13	.....	166·5
May	27	90	7	23	48·39	6	1·20	7·	174·6
June	11	88	2	33	61·30	10	4·37	.....	224·9
July	25	84	26	38	61·16	8	4·13	.....	285·3
August	1	84	5	41	61·61	6	2·35	.....	245·5
September	5	88	24	26	53·33	4	·55	.....	200·9
October	2	73	28	5	33·22	2	4·87	16·	107·2
November	5	53	13	3	27·07	.....	.....	7·50	99·2
December	11	43	25	−12	17·10	.....	.....	·50	123·2
1914.									
January	5	44	24	−34	7·19	.....	.....	12·50	83·2
February	27	45	5	−38	−4·83	.....	.....	4·	113·2
March	14	47	27	−19	21·93	.....	.....	10·	111·6
	.....	.....	.....	.....	.....	57	17·60	57·50	1,935·3

Reckoning 10 inches of snowfall as equivalent to 1 inch of rainfall, the total precipitation for the year ending March 31, 1914, was 23·35 inches.

EXPERIMENTAL STATION FOR CENTRAL SASKATCHEWAN.

ROSTHERN, SASK.

CHARACTER OF THE SEASON.

The precipitation was lower in 1913 than in 1912 or 1911, but was more evenly distributed throughout the season, which developed a much more even growth in the grain crops than occurred in 1912. Coupled with this was the fact that in 1913 there

were no severe frosts until September 20, which allowed the grain to mature fully. The grain of 1913 was therefore of a superior grade.

There was the least snowfall in 1913-14 of any season since the establishment of the Station in 1909.

A severe hailstorm, damaging an area 2 miles wide and more than 30 miles long, passed within half a mile of the Station on the north side on July 25. The crops within the area of this storm were a total loss. On September 5 lightning struck and burned a shock of oats at a distance of 400 feet from the Superintendent's residence. Following is the weather record for the year:—

METEOROLOGICAL RECORDS.

Month.	Temperature F.				Precipitation.	Hours of Sunshine.
	Maximum.	Date.	Minimum.	Date.		
1913.					Inches.	
April	72·2	16	14·8	2	·26	203·0
May	78·7	7	22·1	13	1·26	227·9
June	85·7	11	35·0	6	1·87	234·7
July	84·1	29	39·7	27	3·80	289·2
August	82·1	30	39·7	17	3·59	248·7
September	84·1	5	29·7	20	2·89	231·5
October	69·0	2	0·7	29	0·29	126·4
November	52·9	5	− 3·9	19	0·34	109·9
December	33·0	10	−21·8	24	0	109·5
1914.						
January	35·5	7	−32·3	30	0·65	97·9
February	38·8	28	−42·8	6	0	146·9
March	38·0	12	−15·9	6	0·55	149·1
Total					15·50	2,174·7

FIELD HUSBANDRY.

The work in the rotations carried on since 1911 is attracting more general interest each year, and demonstrating the great importance of the effect of humus in the soil as furnished by hay crops, and the increase of grain yields due to the inclusion of both grass and roots in the rotation, as well as to the greater quantity of manure supplied by a rotation involving crops which necessitate the keeping of a large number of live stock. Another marked effect of a rotation involving a variety of crops is the eradication of weeds. No attempt is made to handpull weeds from the grain crops on any of the rotations, and it is found that with good cultivation in a rotation involving summer-fallow, followed by roots, followed by grain seeded down, there are practically no weeds left in the succeeding crop. This applies particularly to wild oats, which are such a menace to agriculture in the West.

The work in cultural investigation, begun in 1911, has not been continued sufficiently long to give definite conclusions. The most notable feature in any of the experiments, is the good effect on wheat and a succeeding crop of oats of an application of manure on summer-fallow. Unfortunately a number of these experiments have been interfered with on account of their location on ground affected by "alkali." An effort will be made to begin some of these experiments again on more uniform plots.

CEREALS.

A number of varieties of wheat, oats, and barley, that had been under trial for some time, were discarded in 1913, and a number of new varieties were added, particularly some new hybrid wheats bred by Dr. Chas. Saunders. None of the new wheats proved in the one year of trial to be so satisfactory in every way as Marquis. The Prelude wheat, although much earlier than the Marquis, and of apparently as good quality, does not yield sufficiently to warrant its adoption in a district similar to this.

FORAGE CROPS.

Ten strains of red clover were sown on summer-fallowed land in the spring of 1913 and made good growth during the season. They were not cut, so that their own growth served as a winter mulch for the roots. In the spring of 1914 the plants were almost totally killed. Whether the injury came from winter-killing or from being smothered by too much mulch can not be determined. A further attempt will be made to find out whether the crop is adaptable to the winter in this district.

The red clover sown with rye grass and alfalfa for mixed hay in the rotation came through the winter in good condition, and has done so for the three past seasons.

Alfalfa.—Not a great deal of work has been done yet in alfalfa, but enough has been done to demonstrate that it can be grown successfully in this district. One acre of Grimms' alfalfa, sown in 1910, yielded, in 1913, 3,102 pounds, and 1 acre of Turkestan sown at the same time yielded in 1913, 2,470 pounds. In August, a plot was sown to alfalfa and cut once in the autumn to check weed growth. This plot came through the winter in excellent condition.

HORTICULTURE.

Horticulture at the Station received new impetus in the spring of 1913 by the employment of a qualified gardener. This, together with the fact that the hedges planted for windbreaks in 1910 and 1911 are now large enough to be of some effect, has caused the horticultural feature of the farm work to draw considerably more attention. The bush fruits planted in 1910 came into good bearing in 1913, and yielded for the first time. The strawberry plants had been mulched in the autumn of every year since the farm was started, but in the spring of 1913 it was not removed until nearly the end of May. It is thought that this is the reason why we had a good yield of strawberries in 1913; by the mulch having been left on, the buds were protected from the late spring frosts.

Some of the apple trees planted in 1909 began to yield in 1913. One tree yielded twenty-seven fair-sized apples.

Flowers.—Over a quarter of a mile of flower border around the lawn laid out in 1912 and partly planted, gave a magnificent display in 1913. The asters made a particularly brilliant showing towards autumn, while the tulips were the prominent feature in the beginning of the season. The shrubs, particularly the *lonicera*, *syringa* and *spirea* made a good showing. Most of those planted in 1910 flowered for the first time in 1913.

Vegetables.—Owing to the increased protection afforded by the greater growth of the windbreaks, the vegetables were more satisfactory than previously. This was the first season tomatoes, squash, cucumbers and corn ripened.

The cultural experiments in potatoes of 1912 were repeated in 1913. Some of the results were not so marked, but on the whole were quite satisfactory.

ANIMAL HUSBANDRY.

The first attempt made here at a systematic experiment in animal husbandry was begun in November by the purchase of eleven steers for experimental feeding. The attempt is quite justified by the results.

Horses.—There are five work horses and two drivers at the Station which are quite sufficient to do the work.

Live Stock Demonstration.—On March 23, upwards of forty farmers assembled at the Station for a demonstration in judging and feeding steers. The driveway of the new barn was fitted up with special lighting and seats, and the steers used in the feeding experiment were used for demonstration purposes.

The appreciation expressed by the visitors warrants the repetition of such meetings.

BUILDINGS.

The new barn which was begun in the autumn of 1912 but which was delayed because of inclement weather, was completed in 1913. It is 40 feet by 70 feet with 18-foot walls, and has accommodation for ten horses and five cattle, besides a grain room 20 feet square, and a drive way 30 feet wide, the full width of the barn.

Adjoining the barn and opening into the feed alley of the cow stable is a root cellar of solid cement 40 feet by 30 feet and 7 feet 6 inches high at one side and 7 feet at the other.

An old building 90 feet long and 20 feet wide that had served as a granary and workshop was remodelled, placed on a brick foundation and sheeted outside and inside. A granary occupies one end and the remainder is made sufficiently warm to serve as a workshop. By means of this, much work such as cleaning seeds and repairing implements and tools can be done during the winter that heretofore had to be delayed until spring.

GROUNDS.

The lawns and bordering shrubs and trees are sufficiently established and developed now to afford a fair idea of the plan in view in the laying out of the grounds.

EXHIBITION.

With the assistance of the Superintendent of the Indian Head Experimental Farm, a display of material grown on the Experimental Farms was made at the Prince Albert Exhibition, which elicited much favourable comment, both from the Exhibition Board and from visitors. The display consisted chiefly of sheaves of grains and grasses, preserved fruits, vegetables, shrubs and young trees.

DISTRIBUTION OF SEEDS.

In the spring of 1913 there were 434 samples of potatoes sent out, besides a number of bundles of maple, ash, and cottonwood plants.

EXPERIMENTAL STATION FOR NORTHWEST SASKATCHEWAN.

SCOTT, SASK.

The growing season of 1913 opened early in April with bright, warm weather. Work on the land commenced on the 7th, and the first seed was sown the next day. By the 21st, grain was appearing above the ground. The weather then changed to

cool and cloudy, although there was very little rainfall. This continued until the middle of May. The ample supply of moisture in the soil at seeding time and the warm weather at that time assisted germination and growth proceeded evenly and well. The weather from the middle of May on was favourable; bright, warm weather prevailing, with frequent showers.

The harvest was, in general, an early one, a good proportion of the grain crop being in stook in August. Weather conditions were not such as to produce an unusually heavy yield, but rather a fair one and a safe and early harvest, which was carried on under favourable conditions, and before the close of the season, on October 27, threshing and fall work on the land had been completed.

BUILDINGS AND IMPROVEMENTS.

The Superintendent's house, the barns, etc., were wired for electric light, which is obtained from the town of Scott lighting plant.

An experimental building was erected during the year. This is a two-story building; the lower floor contains bins for the storage of large quantities of seed grain, space for cleaning grain, a well-lighted room for use in handpicking seed and a room for samples and display purposes. The second floor is for use in storing the crops from the test plots, etc. The basement is divided into two rooms, one for use in storing roots and the other for a winter work room, cooking feed, etc. Part of one of these basement rooms can be partitioned off for the winter storage of bees.

The main entrance to the Station was changed and a driveway opened up through the lawns. This, with the erection of a lawn fence along the road, adds materially to the appearance of the Station.

CEREAL CROPS.

The regular work with cereals was carried on and satisfactory results were obtained in most of the tests made. Marquis led in yield among the wheats, and Victory in oats. Barley was an exception in that only light yields were obtained.

ROTATIONS.

The five rotations under trial here have all shown a margin of profit for the year's work. Rotation A, one year's duration, gave a profit per acre of $8.79; rotation C, three years' duration, profit per acre, $4.73; rotation J, six years' duration, profit per acre, $5.95; rotation P, eight years' duration, profit per acre, $4.40; rotation R, nine years' duration, profit per acre, $6.63.

CULTURAL EXPERIMENTS.

Four out of the thirteen cultural experiments arranged for the western Experimental Farms are at present laid down. From these four, data of value should soon be obtained. In experiment 5, Methods of Seeding to Grass and Clover, the 1913 figures indicate the advantage of seeding without a nurse crop and of seeding on summer-fallow or root ground, to obtain the largest yield.

In experiment 11, Depths of Seeding for Wheat and Oats, the results are this year, as last, favourable to seeding at a depth of three inches.

HORTICULTURE.

The work in horticulture was more successful than in previous years. Tomatoes ripened on the vine, cucumbers grew in the open, celery came to the table stage and corn was practically in use. Additional stocks of ornamental trees and shrubs, apple seedlings and small fruits, were received and set out. Strawberries, raspberries and currants of good quality were gathered.

LIVE STOCK.

During the year a driving mare was purchased, and a colt was obtained from one of the work mares, bringing the total number of horses to eleven head.

In October, 1913, seventeen steers were purchased for an outside feeding experiment. They were pastured until December 2, when they were put into the corral and started on a light meal ration. This was gradually increased until the animals were on practically full feed. The gains made were fair but, owing to the low price at which the animals were sold, the work was conducted at a loss.

VISITORS.

Nearly 800 visited the Station during the year, most of them in July and August. On July 17, an excursion was held at the Station under the charge of the Scott Board of Trade, which was well attended.

METEOROLOGICAL RECORDS.

Months.	Highest Temperature F.		Lowest Temperature F.		Mean Temperature.	Total Precipitation.	Hours Bright Sunshine.
	—	—	—	—			
1913.	Day.	Deg.	Day.	Deg.	Deg.	Inches.	Hours.
April	13	79·0	25	14·1	41·23	1·15	218·1
May	26	84·9	6	18·2	45·61	·95	247·3
June	10	89·1	14	28·7	56·72	1·28	220·1
July	20	87·4	31	35·2	59·85	2·98	282·3
August	29	86·1	17	24·3	57·80	2·62	228·8
September	4	86·0	24	23·1	57·24	1·24	234·5
October	1	72·0	28	− 5·4	32·99	·46	137·0
November	4	54·8	21	− 8·8	23·90	·25	108·8
December	4	40·5	27	−12·8	15·57	·08	101·1
1914.							
January	5	38·0	24	−40·1	1·91	·65	96·6
February	27	37·2	3	−41·6	5·70	·03	128·5
March	14	44·0	26	−21·9	19·37	·20	157·9
						10·89	2,191·0

EXPERIMENTAL STATION FOR SOUTHERN ALBERTA.

LETHBRIDGE, ALBERTA.

THE SEASON.

The season of 1913 opened at about the usual time for the district. Winter grain, however, suffered, many areas in the winter wheat fields being badly injured owing to the high, dry winds that prevailed. Spring seeding commenced early in April, germination was rapid and a good stand was obtained in all cases. The rainfall during the spring was scant, especially during late May and early June. Crops of all kinds suffered acutely, particularly early-sown grain. The rainfall, from late June on, was reasonably satisfactory. The late rain, however, stimulated

The Farm Boarding House, Agassiz, B.C.

a second growth which caused uneven ripening and thus materially reduced the yield and quality of both wheat and barley. The result with oats was better, the second growth being so strong and vigorous that it reached maturity before any serious loss was suffered from the shelling of the first growth.

METEOROLOGICAL TABLE.

Month.	Temperature F.			Precipitation.	Sunshine.
	Maximum.	Minimum.	Mean.		
1913.	Degrees.	Degrees.	Degrees.	Inches.	Hours.
April	81·2	17·0	43·8	0·52	223·4
May	83·3	19·2	48·45	1·70	244·8
June	86·6	39·9	60·96	4·70	281·8
July	89·2	38·0	61·89	1·29	345·0
August	92·8	35·8	54·21	1·93	321·2
September	89·3	26·2	59·9	1·65	276·5
October	78·2	12·3	39·2	0·50	152·7
November	58·0	9·0	35·1	0·36	121·8
December	69·0	− 7·0	29·57	0·00	156·0
1914.					
January	55·1	−27·0	17·05	1·55	104·1
February	48·1	−40·0	11·05	0·96	120·4
March	64·0	−15·9	29·42	1·12	207·4
				16·28	2,555·1

ROTATION OF CROPS.

Among some of the interesting points brought out in the rotations for the season are:—

On Non-irrigated Land.—1. Wheat following corn yielded as well as wheat after summer-fallow, and much better than wheat following turnips. The latter difference is no doubt due to the fact that the roots made considerable growth in the fall, thereby using up moisture, whereas the corn ceased growth with the first frost.

2. A good profit was obtained from alfalfa seed when the crop was planted in rows and intertilled.

3. Heavy yields of oats and peas, grown for feed, were obtained when sown on summer fallow.

On Irrigated Land.—1. The yield of spring wheat was over 52 bushels per acre following potatoes.

2. Potatoes planted on alfalfa sod gave a yield of 635 bushels 30 pounds per acre.

RATES OF SEEDING.

Tests to determine the correct quantity of wheat, oats and barley to sow have now been conducted for five and, in some cases, six years. Each of the above grains has been seeded at the rates of 15, 30, 45, 60, 75, 90, 105, and 120 pounds per acre. The preparation of the land in nearly all cases, each year, was summer-fallow.

The results in 1913 correspond closely to the average of past years. Without exception, the smallest amounts of each gave the lowest yields. The crops obtained increased quite rapidly with the amounts of seed used up to a certain point, after which the increase was small and irregular. It is the point at which this change takes place that appears to be the most profitable quantity of seed to use. Our results to date indicate the following rates of seed to be the best:—

Winter wheat, non-irrigated, 60 pounds per acre.
Spring wheat, non-irrigated, 75 pounds per acre.
Oats, non-irrigated, about 75 pounds per acre.
Barley, non-irrigated, 75 to 90 pounds per acre.
Spring wheat, irrigated, 90 to 105 pounds per acre.
Oats, irrigated, about 90 pounds per acre.

The results with barley on the irrigated plots have not been uniform, and it is therefore difficult to draw definite conclusions. From the data to hand, however, 75 to 90 pounds per acre may be recommended.

SOIL CULTURAL EXPERIMENTS.

The dry-land soil cultivation investigations incepted in 1911 were carried out successfully, but as yet few of the experiments have shown any marked results. Some interesting points, however, have been brought out, which may be briefly mentioned.

Prairie Breaking.—In this experiment, the results have brought out nothing that has not before been fairly well demonstrated. They strongly support the contention that sowing crops immediately after breaking is unprofitable, and point out that the most advisable and practical method of procedure on new land is to break the sod in the spring and allow it to lie till the following season before cropping.

Depth of ploughing.—The plots ploughed 3 and 4 inches deep appeared to suffer from drouth before those ploughed 6 and 7 inches deep. Ploughing beyond the latter depth, however, seemed of no advantage.

Time of Ploughing.—One of the most striking results observed, because it happened almost without exception, was the fact that land ploughed in the fall gave poorer returns than that which was ploughed in the spring. Similar results have been obtained in previous years, but the difference has never been so marked as was the case this year. No doubt the dry winter with its scanty rainfall was, in a great measure, responsible for these results.

CEREALS.

The usual variety tests of wheat, oats, barley and peas were carried out on both the irrigated and non-irrigated land. There was nothing striking in the season's results in these investigations that would warrant special mention.

FORAGE CROPS.

Corn has done much better than usual this season. Some varieties, such as Northwestern Dent, Canada Yellow and Longfellow, ripened a few ears. The heaviest yielding sort in the variety test on the dry land was the Ninety Day, which yielded at the rate of 11 tons 1,064 pounds of green feed per acre. The best yielding variety on the irrigated land was Compton's Early, which gave a yield of 15 tons and 1,278 pounds per acre.

Turnips, mangels and carrots did reasonably well.

On the dry land, the yields of hay were very light. Brome grass produced only 1,580 pounds and Western Rye 1,160 pounds per acre. Alfalfa sown broadcast yielded only 1,481 pounds per acre, whereas alfalfa sown in rows yielded about double this amount. It would appear, therefore, that for hay as well as for seed purposes, it will pay to sow this crop in rows far enough apart to permit of cultivation.

On the irrigated land, the average yield of hay was between four and five tons per acre, this being slightly below the average for the past five or six years.

HORTICULTURE.

The season has been a particularly favourable one for horticultural work. Trees and shrubs came through the winter with slight injury, and appeared, with few exceptions, to be in a strong, vigorous condition in the spring. A large number of apples bore fruit for the first time. The yield of small fruit was quite satisfactory. On account of the late fall, the more tender vegetables such as tomatoes, corn, squash, etc., matured somewhat better than usual.

STOCK.

No breeding stock is kept on the farm up to the present time.

A steer-feeding experiment was conducted during the winter. Nineteen head were divided into three lots.

Lot I.—Fed on alfalfa hay, roots and meal made a net profit of $10.81 per head.

Lot II.—Fed on alfalfa hay, oat sheaves, meal, and roots made a net profit per steer of $16.04.

Lot III.—In which were included the culls, and were fed similarly to lot II made a net profit of 57 cents per head.

The average net profit per head of all the steers in the three lots was $8.68.

A sheep-feeding experiment was conducted consisting of 250 range lambs and 50 range yearlings, divided into six lots of fifty each.

Group I.—Yearlings, fed alfalfa hay, meal, and roots made a net profit per head of $1.31.

Group II.—Lambs, fed alfalfa hay, meal, and roots made a net profit of $1.16 per head.

Group III.—Lambs on a longer feeding period and sheared before being sold, fed on alfalfa hay and roots, made a net profit of $1.37 per head. (This group received meal after other groups were sold).

Group IV.—Lambs, fed alfalfa hay and meal made a net profit of $1.15 per head.

Group V.—Lambs, fed alfalfa hay and screenings made a net profit of $1.90 per head.

Group VI.—Lambs, on a longer feeding period and sheared before being sold, fed on alfalfa hay alone made a net profit of $1.42 per head. (This group received meal after the other groups were sold.)

MEETINGS AND CONVENTIONS ATTENDED.

The Superintendent attended and addressed a number of farmers' meetings in this part of the province, also the Western Canada Irrigation Association Convention held at Lethbridge. He attended the International Dry Farming Congress held at Tulsa, Oklahoma, and acted in the capacity of Chairman of Jury of Awards at the International Dry Farming Soil Products Exposition which was held in conjunction with the Congress.

VISITORS.

The number of visitors to the Station during the year that were actually counted was 2,108. No doubt many more than this came.

DISTRIBUTION OF SAMPLES.

3-pound bags of potatoes sent out	1,891
Packets of cuttings (willow and poplar)	90
5-pound bags of winter wheat	12
150-pound bags of inoculated alfalfa soil	33

EXPERIMENTAL STATION FOR CENTRAL ALBERTA.

LACOMBE, ALBERTA.

With the exception of a frost on May 18 the weather during the spring and summer of 1913 was favourable for the production of all crops commonly grown in this district. While there was sufficient rain at the time crops required moisture to produce a satisfactory crop, yet the precipitation for the entire season was the least of any year recorded at this Station, except 1910. The total precipitation for the year was 14.115 inches.

This Station now has 20 head of horses, 101 head of cattle, 20 head of sheep and 24 hogs of various ages. All this stock appears to be thriving, and many of the dairy cows have made satisfactory records during the year. The Holstein heifer "Lawnerest Lee Beets," 2 years old, has produced 8,166 pounds of milk, while "Lawnerest Rosa Echo," whose lactation period is not completed at this date, has given 11,143 pounds during the year.

The first apples of any kind to be produced at this Station were ripened last season and were satisfactory as to size and quality for the variety. Many seedlings are being grown with the hope of securing a variety that will prove hardier than anything being tested at present. A satisfactory crop of currants and raspberries was produced last season.

A splendid range of varieties of trees and shrubs for ornamental purposes are proving hardy in central Alberta, and it is certain that the home grounds may be made very attractive by any farmers willing to give the required time and attention.

A large amount of new woven wire fence (six and one-half miles in all) was erected during the year. This new fence, together with that planned to be erected the coming season, will complete the fencing on the new farm recently acquired, and all fields will be fenced for all classes of stock.

The Superintendent was one of the representatives of the Department of Agriculture at the Dry Farming Congress at Tulsa, Oklahoma, in October. He acted as judge of sheep and swine at the Winnipeg Industrial Exhibition and judge of dairy cattle at the Regina Summer Fair, and also acted as judge of sheep and swine at the Regina Winter Fair. He addressed institute meetings at Consort and Hazelmere, and gave addresses before the Farmers' Convention at North Battleford, Saskatchewan. He was also a representative of the Department of Agriculture at the banquet tendered J. C. Hill & Sons by the Board of Trade of Lloydminster, Sask.

DISTRIBUTION.

A total of 627 samples of potatoes and 13,175 Manitoba maple and 5,300 Caragana seedlings were distributed to farmers living in central Alberta during the spring of 1913.

METEOROLOGICAL RECORDS.

	Temperature.				Precipitation.	Sunshine.
	Maximum.	Date.	Minimum.	Date.		
1913.	Degrees.		Degrees.		Inches.	Hours.
April	77·8	12	17·4	23	·15	260·8
May	77·4	25 & 30	18·1	5	·48	277·1
June	81·8	9	36·2	17	2·98	271·9
July	84·8	24	31·9	25	3·43	336·3
August	84·0	26	35·5	19	2·43	311·1
September	80·0	8 & 27	24·4	23	·59	240·4
October	81·5	1	9·7	30	·68	141·7
November	59·8	3	− ·5	23	·05	146·2
December	57·8	10	−13·3	25	·07	136·7
1914.						
January	53·6	6	−36·1	24	1·45	73·5
February	48·6	24	−41·6	5	1·00	120·1
March	64·0	12	−23·6	26	·80	153·8
					14·11	2,469·6

EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

Agassiz, B.C.

On the whole the weather conditions were more favourable this year than last, though the spring was wetter than that of 1912. The rain in April retarded seeding operations to some extent, and May and June were also wet, but, since there were alternate rainy and fine spells, the work was not materially affected. July was reasonably warm and dry, and August also, though occasional heavy showers fell in the latter month.

In the latter part of September there was a spell of fine weather; but October and November were wet, a condition which rather interfered with the root and corn harvest. No frosts were experienced before November 14. December and January were mild until the end of the latter month, when the first snow fell. The cold spell lasted until February 5, after which it was very mild and warm till towards the end of March, when there were 10 degrees of frost, very cold winds and snow. Coming as it did after the mild weather, this cold spell did considerable damage.

The meteorological data are given below:—

METEOROLOGICAL RECORDS.

Months.	Maximum Temperature		Minimum Temperature		Mean Temp.	Total Precipitation.		Sunshine.		
	Date.	Deg.	Date.	Deg.	Deg.	Rain.	Snow.	Days.	Hours.	Mins.
1913.						in.	in.			
April	19	75	28	33	51·27	4·72		21	125	48
May	31	78	5	33	52·22	6·08		16	120	6
June	1	84	6, 17, 20	40	58·31	7·33		24	147	6
July	22	91	16	45	52·45	3·71		25	189	48
August	1	91	17, 19, 20	46	64·47	2·71		26	202	30
September	13	78	15	40	56·51	7·68		23	170	42
October	1	66	6, 28, 29	33	47·77	8·84		15	73	22
November	2	61	14·20	25	45·23	12·29		9	39	30
December	2, 3, 6, 7, 11	50	23	29	40·22	3·36		11	55	12
1914.										
January	4, 6, 11	49	28	12	38·00	13·33	27	5	12	36
February	26	60	5	12	39·56	3·43	7	11	66	54
March	19	73	26	22	45·02	3·12	2	17	98	30
Total						76·60	36	263	1,302	4

In spite of the showery weather, the farm crops made a very satisfactory showing, with the one exception of the wheat crop, of which mention is made later. All were harvested in good condition. The following crops were grown to feed the live stock:—

Clover hay	116 tons	960 pounds.
Corn silage	224 "	1,770 "
Mangels	136 "	110 "
Carrots	9 "	1,980 "
Sugar beets	6 "	100 "
Turnips	10 "	800 "
Potatoes	16 "	1,500 "
Mixed grains	968 bushels.	
Barley	100 "	
Peas	45 "	

Different kinds of fertilizers and manures were tried with mangels. It is impossible, however, with but one year's work on these trials, to draw conclusions of any definite value.

This year, 205 rods of permanent fence has been erected. In addition to the replacing of old fencing on the boundaries, it has been found necessary to divide the Farm into four sections, so as to be able to change the pasture in accordance with the system of rotation followed. Also, with the advent of the new dairy herd, a greater number of lanes and yards have been constructed, and the grounds and gardens have had to be protected.

A good deal of labour has been expended on the farm roads. The new roads have borders 8 feet wide sown to a grass mixture, and being fenced in are capable of being used as paddocks when need arises. Both the avenue leading from the highway and the central farm road have been gravelled to a depth of 6 to 18 inches, and gravel has also been spread in the exercising yards for the cattle. A cement footpath has been laid from the main building to the highway.

The horses being kept entirely for working purposes, there is no experimental work to be reported. Some useful figures have been collected, however, on the cost

of food and care. One new team has been added to the force, a pair of three-year pure-bred Clydesdale fillies. These were bought at the close of the year. The horses were kept busy throughout the entire year with the various improvements, roadmaking, etc., and are in good condition at the present time.

With the herd of grade Holstein-Friesian cattle, breeding work has been continued, and at the same time a careful testing of each individual has been kept up, with the object of obtaining uniform groups for experimental work.

The whole herd shows a better average performance than last year. Of the calves born, 50 per cent were heifers, and all these have been raised. The total number of animals now in the herd is sixty. This year figures were collected on the cost of raising yearling heifers and some work was done to find the cost of vealing dairy bull calves. Some bacteriological testing was done by Mr. G. H. Unwin, of the Health of Animals Branch. The results show the important part played by air-borne organisms in milk contamination. This is more particularly the case where care and cleanliness are observed in handling the milk and utensils; since a dust-laden air is shown to be capable of producing a dirty sample of milk, even with the most careful handling and the cleanest of milk pails.

With hogs, the work in breeding and feeding has been very successful. The breeding stock at present consists of twenty-seven head; one aged boar, two young boars, eight sows over one year, and sixteen sows under one year. The breeding stock was kept in the "A" shaped cots. This method of housing has proved very satisfactory, both in the number of pigs farrowed and the number raised.

Some useful information has been gathered on the cost of raising a litter of young pigs. A record was kept of the cost of the sow's maintenance during the winter, and during the period from farrowing to weaning time. It was found that the cost of food per pig raised, during the whole period, was $1.55.

A great deal of work has been done to ascertain the value of rice-meal for fattening hogs, and the results are important. Though the accommodation for this work was limited, over one hundred pigs have been put through these trials. It has been proved conclusively that rice-meal is not a profitable food for fattening hogs. It has been proved, moreover, that it is injurious. In every case where the rice-meal was fed either exclusively or in a half-and-half mixture with other grains, it produced a diseased condition, strongly resembling beri-beri in man. The diseased pigs were examined by Dr. Hawden, Health of Animals Branch. His post-mortem findings determined the specific nature of the disease.

In the flock of Dorset Horned sheep no experimental work was done owing to lack of accommodation. The winter being mild the sheep were pasturing the whole year, with the exception of one week.

It is pleasing to be able to report an advance in the poultry work, which was reorganized at the beginning of the year. Mr. V. Kuhn has been placed in charge of the details of the work and has collected a great deal of information which forms a good foundation for future experiments. The entire flock, for laying and breeding, numbers 342 birds, of which 66 are Barred Plymouth Rocks, the remainder White Leghorns.

The farm dairy since June has been in the charge of Miss R. Keene. The work has been, first, the handling of the product of the dairy herd in the form of sweet cream, butter, soft cheese, and a limited amount of high-class bottled milk, sold locally. A considerable amount of milk-testing has been done. In addition to the regular testing of the herd individuals, there have been some special tests for the pure-bred cows. Also, a number of samples have been sent in for testing from the surrounding district. Experiments were made with corrosive sublimate and formalin as preservatives of milk for testing.

In the making of soft cheese fair success can be reported, though the dairy is too small and the equipment too limited for any extensive work.

Of the cereals, the wheat crop was a complete failure. The entire crop was badly infested with the wheat midge, and nothing was harvested.

Twelve varieties of oats were grown from selected heads. Of these the earliest variety was Eighty Day, the latest Danish Island. The Lincoln gave the highest yield. Four varieties were grown for hay of which Swedish Select gave the best results.

Of the fifteen varieties of barley, the earliest was Success, which matured in 100 days, and which gave the lightest yield. Danish Chevalier matured in 115 days and gave the largest yield of the varieties grown.

As forage crops, there were grown eleven varieties of mangels, eight varieties of Indian corn, nine varieties of carrots, ten varieties of turnips, and three varieties of sugar beets. All these were grown in the double-plot system, which has given better satisfaction than the single plots. There being plenty of moisture throughout the season, all root crops gave reasonably good results. The turnips were badly infested with the cabbage maggot, and, though they were given thorough treatment, the crop necessarily suffered. Figuring from the gross yield per acre of the mangels, Danish Sludstrup stands first with 36 tons, 1,700 pounds. Prize Mammoth Long Red was second in yield.

With the varieties of Indian corn, Compton's Early and Early Longfellow again head the list.

Of the carrots, Improved Short White was again best, and with sugar beets the largest gross yield was obtained from Klein Wanzleben.

The principal horticultural work was the testing of vegetables, of which 105 varieties were grown with varying success. Next in importance was the variety testing of flowers and bulbs. Considerable work was also expended on the grounds and in the handling of the young orchard of 4 acres, containing apples, pears, plums, cherries, blackberries, gooseberries, black, white and red currants and strawberries.

During the year, 314 samples of potatoes were distributed.

EXPERIMENTAL STATION FOR THE UPPER COLUMBIA VALLEY.

Invermere, B.C.

The present Superintendent, Mr. G. E. Parham, took up his duties early in April, 1913.

During the previous season, much of the land had been cleared, a barn had been built and general preparatory work done, under the supervision of Mr. Duncan Anderson. In 1913, the Superintendent's house was erected, as well as a cottage for the farm foreman.

NOTES ON THE WEATHER.

The spring of 1913 was backward, frosty nights occurring until the end of April. There was also a frost on the night of June 5. In general, however, the weather conditions during the summer and autumn were favourable to farming operations. The rainfall was about the average (9 inches) and fell at such times as to save a great deal of irrigation. The winter of 1913-14 has been exceptionally mild; sleighing commenced on January 21 and the snow disappeared during the first week in March.

As horticulture is to be a main feature of the work at this Station, a special effort was made this year to get the orchards set out and experimental work with fruits, vegetables and flowers under way. Planting was commenced in April of many varieties received and heeled in the previous autumn. Five hundred and thirty-seven apple trees of different varieties were set out. Some of these have been winter-killed, but the hardier sorts seem to have stood the winter well.

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Driveway, Experimental Station, Sidney, B.C.

Winter-killing was severe among the cherries, plums, pears, and peaches set out. Bush fruits did well, except the blackberries and some varieties of gooseberries. Grapevines were winter-killed.

All the above are being grown under irrigation, and experimental work will be carried on in different methods of cultivation, with varying amounts of water and times of application.

Vegetables were also grown under irrigation. With the exception of cabbages and peas, which were irrigated twice, only one application of water was required, owing to timely rains. Experiments as to amount of water and times of application will be carried on with vegetables also.

Forty varieties of vegetables were tested under similar conditions as to cultivation and irrigation.

The success obtained with flowers was marked, and the season of bloom prolonged.

Some field crops were grown, but no experimental work with cereals, roots, or grasses was attempted. Outside of horticulture, the work done was preparatory in nature, such as clearing and grading for irrigation. Seventeen acres on the west side of the Station were enclosed with a strong poultry and cattle fence, and 2 acres of the low land has been cleared and got ready to sow with clover and alfalfa.

Work with live stock has not yet been commenced. Three horses have so far done the work of the Station. A beginning has been made with poultry, and it is planned to make poultry keeping a special feature of the work at this Station.

The Superintendent has addressed various farmers' meetings during the year and has rendered considerable assistance to ranchers in the vicinity by personal visits and advice. He has also taken part in the formation of a co-operative society in connection with the Farmers' Institute of the Windermere district.

Under his supervision, an exhibit was made of the products of the Station at the Athalmer Fair, got up by the Windermere District Agricultural Association.

METEOROLOGICAL RECORDS.

Month.	Temperature F.			Precipitation.			Total.	Sunshine.
	Date.	Max.	Min.	Date.	Rainfall.	Snowfall.		
1913.		°	°		Inches.	Inches.	Inches.	Hours.
July	21	93	Not kept	.....	1·74	.....	1·74	Not kept.
August	2	90	.....	.....	1·55	.....	1·55	.....
September	18	76	.....	.....	1·80	.....	1·80	193·8
October	2	63	.....	.....	·42	.....	·42	117·6
November	2	45	.....	.....	·63	2*	·63	60·5
December	15	40	− 6	23	0	0	0	41·4
1914.								
January	6	46	−11	23	·75	10·5	2·25	54·5
February	27	46	−27	4	0	·5	·5	73·6
March	17	54	− 5	25	·07	3·25	·39	144·8

*Ten inches of snow equals 1 inch of rain.

The recording apparatus set up at this Station was not complete until December.

EXPERIMENTAL STATION FOR THE SAANICH PENINSULA.

SIDNEY, B.C.

The climate of this part of Vancouver island is very mild and equable, extremes of temperature being rarely met with. While the precipitation during most of the growing season of 1913 was very light, only .05 inch falling from April 26 to August 16, the atmosphere was humid, and the crop yields satisfactory.

WORK CARRIED ON.

Clearing operations were vigorously pursued on 78 acres partly cleared and reported on last year, and also on the 47 acres left uncleared on March 31, 1913.

The roots, windfalls and logs were piled by a donkey engine in several piles 100 feet high, with a base 60 feet in diameter. The bottom of each pile was closely packed with logs of from 2 to 8 feet diameter. In these, 150 holes were bored and 150 sticks of stumping powder put in singly. These were fired simultaneously. The vibration packed the whole mass and shook the dirt from the roots. The heaps were then fired, leaving only some 7 per cent to repile. This clearing operation cost $220 per acre.

After the piles were burned out, clearing the land of rocks and roots was commenced. Dynamite was used to break up the large boulders, some of which weighed over 10 tons. The amount of rock removed averaged 50 tons to the acre and its removal cost $105 per acre. The material was used to bed new roads, make railway and road crossings, bridges and retaining walls on the sea beach.

A general survey was then made and levels taken for ditching, grading, road-making, fencing, etc. This work was then proceeded with, the labour connected with the various items costing as follows:—

	Per rod.
Ditching (after being cleared and stoned)	$1 00
Draining with 3, 6, and 8-inch tile	1 00
Roadmaking for farm purposes	1 40
Roadmaking for transportation (team, grader, and labour)	3 00
Fencing, including cedar posts	1 08

AGRICULTURE AND HORTICULTURE.

As soon as the land was cleared and drained, the breaking plough was put in, further clearing of rocks and roots was done and the disc harrow, leveller, grader and roller applied. These were followed by the walking plough, spring-tooth harrow and smoothing harrow, after which the soil was ready for the disc seeder. The cost varied according to the nature of the soil, which comprises good loam, quick-sand, turf, and bog, with seams of strong clay containing iron oxide. This thorough preparation cleaned the ground well and got the soil into good condition for after-cultivation.

ROADS.

The 66-foot wide East Saanich road running through the centre of the Experimental Station has been prepared to make a boulevard; tulip trees have been planted 40 feet apart on each side. These will be protected by a border of Kentucky Blue grass.

In July the service road was made through to the sea beach, giving ready access to the British Columbia Electric and the Canadian Northern stations. These are named "Bazan Bay" and are situated in the centre of the Experimental Station.

The 2½ miles of new roads now on the Station are well crowned, both sides are channelled to take away surface water and they are in good condition for transportation purposes.

A great change has been made in the appearance of the Station since clearing operations began eighteen months ago. Then giant cedars and Douglas firs grew 200 feet high, 8 feet diameter at the base and, being deep-rooted took 40 sticks of stumping powder to uproot them; windfalls and twisted logs were cross-piled amongst second growth, treacherous places of quicksand and bog were found, where, if a horse got in, cables were required to get him out. Now automobiles travel over the same ground down to the two railway stations and the sea beach, through avenues planted with shrubs and trees, and fields of fall wheat and rye are growing. There remains, however, much to be done before the plans for this Station may be said to be well under way.

On account of the difficulty and amount of the clearing to be done, the season was too advanced for experimental crop growing, so 30 acres were sown to oats for fodder, white clover, which was ploughed under in the fall, and roots for the stock. These all gave satisfactory crops.

The 30 acres set aside for horticulture has been planted with British Columbia shrubs and plants and fruit trees imported from Japan, France, Germany, the United States and Eastern Canada.

The nursery, orchards, avenue, and arboretum look well, and the lawn sown with Kentucky Blue grass is a good catch.

The five general purpose horses have been fully employed the whole year and are in excellent condition.

METEOROLOGICAL RECORDS.

Month.	Temperature F.			Precipitation.	Sunshine.
	Highest.	Lowest.	Mean.		
	Degrees.	Degrees.	Degrees.	Inches.	Hours.
1913.					
April	65	42	50	0·62	127·48
May	65	40	51	0·80	166·00
June	69	42	57	1·05	167·42
July	82	53	64	0·45	274·48
August	80	50	62·50	0·84	237·18
September	71	46	58·50	1·95	198·06
October	60	36	49·50	3·63	91·30
November	55	41	47	4·70	56·36
December	50	35	44	1·35	33·42
1914.					
January	45	33	39·50	0·47	35·06
February	51	26	44	1·56	65·54
March	67	29	46	2·05	117·24
Totals				19·47	1,569·54

Note.—As the meteorological instruments were not installed at the Sidney Station until February 14, 1914, the above records up to that date were obtained from other observers in the Saanich peninsula. There may be some difference between the temperatures and rainfall at these points and at the Experi menta Station, but the above will give a good idea of the weather conditions of the district.

DOMINION OF CANADA

DEPARTMENT OF AGRICULTURE

DOMINION EXPERIMENTAL FARMS

REPORT

FROM

THE DIVISION OF CHEMISTRY

For the Year ending March 31, 1914

PREPARED BY

Dominion Chemist. - - - - - - - - - - - - - - - Frank T. Shutt, M.A., F.I.C.

REPORT OF THE DIVISION OF CHEMISTRY.

FRANK T. SHUTT, M.A., F.I.C., F.R.S.C.,
Dominion Chemist.

Ottawa, March 31, 1914.

J. H. Grisdale, Esq., B. Agr.,
Director, Dominion Experimental Farms,
Ottawa, Ont.

Sir,—I have the honour to submit herewith the twenty-seventh Annual Report of the Division of Chemistry of the Dominion Experimental Farms.

For the most part the work of the Division during the year now closing has been a continuation of the various researches, investigations and experiments which have occupied our attention for a number of years past, though several new problems of very considerable importance to Canadian agriculture have been attacked.

Very satisfactory progress, we believe, has been made in all the branches of the Division's activities, the increased laboratory accommodation made possible by the extension of the Chemical Building and the appointment of additional assistants on the staff having very greatly facilitated the purely analytical work.

The correspondence continues to increase and the requests of farmers for the examination of soils and other matters of an agricultural nature, become more numerous. This phase of the work, which may be considered as directly educational and advisory, has been encouraged from the first, for the information thus sent out instructs and assists the man on the farm in his difficulties and everyday work. Valuable and important as are the published reports and bulletins, this direct communication with the individual farmer who is honestly seeking for help has had a special influence and value, as our experience of many years has amply proven. It has shown itself to be not only the best and most direct means of reaching the individual, but one that has proved of very considerable service in the neighbourhood or district of the individual, since every farmer, more or less, acts as a centre in the wider dissemination of the knowledge. We have sought to make this Division a bureau of information for the Dominion on subjects relating generally to the chemistry of agriculture, to which all may apply with their questions regarding the nature, composition and properties of soils, manures and fertilizers, forage plants and feeding stuffs, insecticides, the requirements of stock and crops, etc., etc., and the farmers, we are pleased to record, are more and more recognizing that we are able, in supplying the desired information, to assist them very materially.

The samples received for analysis or examination during the past year are classified in the subjoined table, the provinces from which they were forwarded being indicated. Many of these samples have been taken in connection with the several investigations carried on by the Division, but a very large proportion of them have been sent in by farmers.

SAMPLES received for Examination and Report for the twelve months ending March 31, 1914.

Sample.	British Columbia.	Alberta.	Saskatchewan.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	P. E. Island.	Total.
Soils	46	573	491	372	51	78	25	17	2	1,658
Muds, muck and marls	5	5	6	1	9	14	9	13	7	69
Manures and fertilizers	13	1	0	1	7	24	16	6	0	68
Forage plants, fodders and feeding stuffs	5	18	13	8	104	36	7	16	6	213
Waters	24	15	12	12	178	23	8	.....	.....	272
Miscellaneous	6	7	2	4	585	24	3	5	....	635
										2,915

The 'waters' include 84 samples of rain and snow analysed in our investigation to ascertain the fertilizing value of these forms of precipitation, and the 'miscellaneous' include dairy products, fungicides and insecticides and some 500 samples from the Meat Inspection Division, Health of Animals Branch.

Soils.—We now publish fairly complete chemical and physical data respecting a series of soils typical of well defined geological areas in Nova Scotia. These were collected and forwarded by the Secretary of Agriculture for Nova Scotia and our report on them will serve as a beginning to a more exact knowledge of the soils of the more important agricultural areas or districts of that province. Our deductions will furnish information that will be valuable in the economic upkeep and improvement of the soils in question.

The analysis of many soils from virgin or unoccupied areas in Manitoba, Saskatchewan, and British Columbia has also been undertaken, but the results will be held over for future publication, pending a more complete examination of the soils of the districts involved.

There has also been in progress an examination of a large series of soils collected over the area of the Canadian Pacific Railway irrigation tract east of Calgary. The investigation includes a careful search for 'alkali' compounds and their quantitative determination, if found. The publication of these results will also be deferred until the work is completed.

Conservation of Soil Moisture.—The work begun some years ago on certain of the western Experimental Farms and Stations to ascertain the influence of subsoiling, depth and time of ploughing, frequency and depth of cultivation, sub-surface packing, etc., on the moisture content of the soil, has been continued. As this investigation progresses we accumulate proof of the value of early and fairly deep ploughing, of sub-surface packing on light soils and of frequent stirring of the surface crust by cultivation, to conserve moisture.

The Composition of Wheat as influenced by Climatic Conditions.—A continuation of this research has afforded further proof of our contention that the protein content of the cereals may be very considerably influenced by the character of the season, or to state the case somewhat more fully, that the amount of available moisture in the soil and the temperatures prevailing during the filling out of the kernel and its period of maturing, markedly affect its composition. If there is a sufficiency of moisture in the soil during the early part of the season to bring the crop to a good growth, then a fairly dry soil and high temperatures during the later summer months, hasten

maturity and conduce to a hard berry with a high protein (gluten) content. On the other hand when the vegetative period is lengthened and ripening deferred, as by cool and damp weather, the tendency will be towards the production of a soft and starchy grain.

Fodders and Feeding Stuffs.—This chapter deals with the analysis and nutritive value of a number of forage plants and concentrated feeding stuffs. These include by-products of the distillery, brewery, starch factory, and linseed oil mill. Several molasses feeds are also reported on.

We have during the year analysed a large series of samples of elevator screenings and of weed seeds separated therefrom, to determine their food value. The publication of these data, however, is deferred for the present, pending the completion of our inquiry as to the practical usefulness of these screenings in stock feeding.

Fertilizer Experiments with Potatoes.—Information is furnished on the profitable use of fertilizers on the potato crop, as gathered from experimental work carried on at the Experimental Station at Kentville, N.S., and at the Experimental Station, Fredericton, N.B. In this investigation the usual forms of nitrogen, phosphoric acid and potash found in the fertilizer market were used, and the tables of data given show the profits obtained from the various mixtures employed. The largest profits followed in the majority of instances the application of mixtures containing all three elements of plant food, and a further consideration of the data clearly shows that moderate, rather than very large, dressings were the more profitable.

The Relative Value of Field Roots.—This is a continuation of an investigation that has been carried on for some years. The series includes mangels, turnips and carrots, the analysis being made from roots grown on the Central Farm, Ottawa.

The influence of heredity in mangels has been further studied, using the Gate Post and Giant Yellow Globe. The former variety has for the past fourteen years, during which the subject has been under investigation, proved invariably the better root, both as to dry matter and sugar.

Sugar Beets.—Three of the leading varieties of sugar beets, Vilmorin's Improved A., Vilmorin's Improved B., and êlein Wenzleben, have been grown at fourteen of the Dominion Experimental Farms and Stations and representative roots therefrom have been submitted to analysis. The data, as a whole, are very satisfactory, indicating that beets rich in sugar and eminently suitable for factory purposes, may be grown in widely distant parts of the Dominion.

Naturally-occurring Fertilizers.—This chapter includes the analysis of marls, limestones, and other materials of fertilizing value sent in during the year. It also furnishes information as to the use of lime and its compounds in practical agriculture.

Insecticides and Fungicides.—A series of thirteen samples of arsenate of lead, representing the more important brands on the market, has been examined. The detailed analyses are given in tabular form and notes added as to the more salient properties of this valuable insecticide.

Several insecticides and sprays recently put upon the market, have also been analyzed and are here reported on as to their probable value.

Fertilizing Value of Rain and Snow.—The data for the seventh year of this investigation are here presented. During the past year there were furnished from these sources for the enrichment of the soil, 6,208 pounds of available nitrogen per acre. The average amount, per annum, for the past seven years, is 6·182 pounds per acre.

Meat Inspection Division.—This work consists in the analysis of samples collected by the Inspectors of the Meat Inspection Division, Health of Animals Branch

Department of Agriculture, at the various packing houses and fruit and vegetable canneries throughout the Dominion.

During the year April 1, 1913—March 31, 1914, 510 samples have been critically examined as to nature and purity, as follows:—

Lards, tallow, oils and butters	55
Preserved meats—sausages, mince meat, etc.	76
Colouring and dye stuffs	56
Preservatives	67
Pickling solutions	33
Spices and condiments	19
Evaporated apples and apple waste	201
Miscellaneous	3
Total	510

The increase in late years in this branch of work will be apparent when it is stated that for the preceding year the samples examined numbered 185, and for the year ending March 31, 1912, 86. The reports on these materials are submitted to the Veterinary Director General.

The Water Supply of Farm Homesteads.—During the year, 272 samples of water were entered for examination. Of these 84 were from the rain and snow investigation, which has already been referred to. The remainder, 168, were from wells and other sources of water supply on Canadian farms. Of these we reported 62 as pure and wholesome, 44 as highly suspicious, 25 as seriously polluted and 37 as non-potable by reason of high salinity.

We have from the first urged with all the emphasis at our command the desirability of an ample supply of pure water for the health of the farmer and his family, the thrift of his stock and the wholesomeness of his dairy produce. In too many instances, we regret to say, farmers are still using water from barnyard and back-door wells that are seriously contaminated with drainage matter. But we can also record, and with much satisfaction, that there is an ever increasing number who are abandoning these shallow and badly-placed wells for a deep seated source—the bored or driven well—so situated as to be beyond the possibility of local pullution.

Staff: Acknowledgments.—I would acknowledge with thanks the valuable assistance rendered during the year by the staff. Mr. A. T. Charron, M.A., has continued in the general oversight and conduct of the work as First Assistant Chemist, and has been more especially helpful in connection with the correspondence and lectures in French on agricultural subjects. Mr. C. H. Robinson, B.A., has had entire charge of the analytical work in connection with the samples sent in by the Meat Inspection Division, and the analysis of Insecticides and Fungicides. To Mr. A. T. Stuart, B.A., has been assigned the water analyses, the work in connection with the rain and snow investigation, and the large number of nitrogen determinations necessary in so many researches. Mr. J. T. Janson, B.Sc., and Mr. J. M. Scott, M.Sc., have been chiefly engaged in the analysis of soils, fertilizing materials and feeding stuffs.

I have the honour to be, sir,

Your obedient servant,

FRANK T. SHUTT,

Dominion Chemist.

NOVA SCOTIA SOILS.

The four soil samples now reported were collected and forwarded, with notes, by Mr. L. C. Harlow at the instance of Principal Cumming of Truro, N.S., Secretary of Agriculture for Nova Scotia.

Laby. No. 8758.—Labelled No. 4N. 'From farm of Mr. Cock, New Annan, Col. Co.; cultivated area, for many years in grass, but not manured; in river valley which is frequently overflowed; only surface drained; soil probably about 2 feet deep. Typical of many miles, as the river valley broadens.' A coarse and very loose gravelly loam of a deep brown colour and showing an abundance of root fibre.

Laby. No. 8759.—Labelled No. 6N. 'From farm Jno. Cunningham, Bay Head, Col. Co.; virgin soil but used for pasture, covered with laurel and dry upland grass; no drainage. The north shore of Colchester county has much soil of this nature.' A light yellowish-grey soil, containing some gravel and of a generally poor, thin appearance.

Laby. No. 8760.—Labelled No. 7S. 'From Otter Brook, Stewiack, Col. Co.; virgin soil, covered with laurel, blueberry, low ground grasses. No drainage, ground low. Depth of soil without apparent change 18 inches. The north side of Stewiack valley has extensive flats of similar soil.' A brownish-red clay loam, without stones or gravel and fairly friable.

Laby. No. 8761.—Labelled No. 18S. 'From property of Mr. M. L. Tupper, Middle Musquodoboit, Halifax Co. Virgin soil, scattered over with small spruce, blueberry, arbutus. No underdrainage, but needs it. With heavy clay subsoil. Typical of west side of valley of Musquodoboit River.' A light-red, loose, gravelly loam, with a fair amount of stones and rock fragments.

The results of the physical examination of these soils are given in the subjoined table, and their study will afford much useful information as to the general nature of the loams, their culture and treatment and their suitability for specific crops.

Approximate Physical Analysis of Soils from Nova Scotia.

Laboratory No.	Stones and gravel.	Fine gravel and very coarse sand.	Coarse and fine sand.	Silt, fine silt and clay, (by difference).	Organic matter. (Loss on ignition.)
	per cent	per cent	per cent	per cent	per cent
8,758	34.6	16.0	30.8	.82	17.78
8,759	10.6	8.8	52.4	24.56	3.64
8,760	.....	.....	59.9	32 35	7.75
8,761	35.2	11.7	34.6	11.55	6.95

Laby No. 8758.—This is essentially gravelly, the proportion of rock fragments being quite large. The greater part of the fine soil (less than 5 mm. diam.) is sand, much of which is quite coarse. The percentage of clay and silt is very small, practically negligible. For a soil of this character the amount of organic matter is very high; it should be remarked, however, that the larger part of this is not humified, but exists as root fibre that has undergone little or no decomposition as yet.

The absence of clay and the coarseness of a large proportion of the sand explain the lack of cohesiveness of this soil and indicate that its crops might suffer very considerably in seasons of drought. The very liberal amount of vegetable matter present would no doubt do much to offset the tendency of this soil to dry out rapidly. In soils

of this type, cultivation leads to the dissipation of organic matter and, therefore, for the maintenance of fertility it will be essential to supply continually humus-forming material as with farm manures and the turning under of green crops. By this means the soil may be made more retentive of moisture and of such plant food as may be supplied in the form of commercial fertilizers.

If the water table is not too high, this soil would readily drain, allowing an easy and complete aeration. This soil should rapidly warm up in spring and respond well in favourable seasons to high manuring. It is not, from the physical standpoint, to be considered a good general farming soil, but it has characters which make it suitable for some crops, prominent among which we might place potatoes, and similar garden crops.

Labg. No. 8759.—This soil differs essentially from the preceding in its smaller percentages of gravel and very coarse sand and its much larger proportion of silt and clay. Though it might be characterized as a clay loam, it contains sufficient coarse material to make it friable and to permit of it being easily worked. From the physical standpoint the exceedingly small organic content is its most unfavourable feature, and it is undoubtedly in the addition of humus-forming material that improvement, first as to tilth and then 'life' of the soil, is to be chiefly looked for.

Labg. No. 8760.—This is a clay or heavy clay loam. With good drainage and careful, rational tillage it should prove a strong, productive soil. With an increased organic matter content, the probability is that the texture would be considerably improved, and hence the desirability of stable manures and the adoption of a rotation which would from time to time add to the soil's store of humus. Besides its valuable influence on the texture, humus may always be considered as an economical source of plant food.

Labg. No. 8761.—This is a gravelly loam, but probably contains sufficient silt and clay to give it 'strength' and make it fairly retentive of moisture. From the viewpoint of texture it should prove very fairly satisfactory for a large range of crops, but the value of organic matter as an amendment, as well as for the purpose of enrichment, may, as in the preceding instance, be again emphasized.

The composition of the soils as revealed by chemical analysis is set forth in the following table. In addition to the amounts of the essential mineral elements of plant food (phosphoric acid, potash and lime) obtained by the use of a strong acid solvent, the percentages of these constituents soluble in a dilute solution of an organic acid have been obtained. These latter may be regarded as representing more or less closely the proportions available for crop use, and hence in a certain degree may serve to indicate the need or non-need of specific fertilizers.

In considering these analytical data with the view of deducing the relative fertility of the soils, it must not be lost sight of that it is impossible to establish rigid standards as regards the minimum amounts of plant food that must be present in order that a soil may be classed as economically productive. Again, it must be borne in mind that the climatic conditions of the district, the drainage and the texture of the soil, play a most important part in maintaining fertility. Further, the amount of humus-forming material and its condition are potent factors, not only in determining the water-holding capacity of a soil, but also in affording nourishment for the micro-organisms of the soil, the role of which is largely to prepare the plant food constituents for the use of farm crops. Especially is this true as regards nitrification—probably the most important of all the conversions into available forms within the soil. These matters, here so briefly discussed, will be found more fully considered in the Report of the Chemist, Experimental Farms, 1897, but possibly sufficient has been said to show that percentages of the more important elements, useful as they are, must not be taken as the sole guide in the valuation of a soil. Its

future culture, drainage, the character of the crops grown and several other factors may profoundly modify the deductions made simply from analytical data.

Analysis of (air-dried) Soils.

Laby. No.	Moisture.	Organic and Volatile Matter.	Insoluble Mineral Matter (sand and clay.)	Oxide of iron and alumina.	Lime.	Magnesia.	Phosphoric Acid.	Potash.	Total.	Nitrogen.	Available Constituents.		
											Lime.	Phosphoric Acid.	Potash.
	p.c.	p.c.	p.c	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
8758	3·52	17·78	57·71	15 97	1.64	1 33	23	·27	98·45	·54	·99	·087	·048
8759	·45	3·64	91·00	3·92	·04	·35	·026	·145	99·57	·107	Nil	·011	015
8760	1·23	7·75	80 07	9 38	·36	·91	·11	·37	100 18	·23	15	·023	·019
8761	1·00	6·95	80 73	10 31	11	·68	·064	·42	100·26	·264	·02	·023	·018

Laby. No. 8758.—A large amount of vegetable matter usually betokens richness in nitrogen, and it is not surprising, therefore, to find this soil characterized by a high percentage of this element. The crude condition of much of this organic matter, however, leads us to conclude that but a small portion of this nitrogen is in a form readily convertible into plant food; we must rather consider this as a store of nitrogen to be gradually made available by good methods of culture. It is quite probable also, for the same reason, that in spite of this apparent abundance of nitrogen, a good response might be obtained from applications of manure, since such furnish readily convertible, nitrifiable nitrogen for the immediate feeding of our crops.

In the mineral elements of fertility—potash and phosphoric acid—this soil appears to be fairly well supplied, the amounts comparing favourably with those obtained from many of our good soils, *i.e.,* of average fertility. The proportions which may be considered as more or less available are, we think, quite satisfactory, indicating no especial or immediate necessity for fertilizers furnishing these elements in soluble forms.

For a soil of a sandy or gravelly character, the lime content is by no means low; we should judge there was sufficient at present both for crop use and for the promotion of nitrification.

Laby. No. 8759.—The very small amount of humus-forming material present in this soil has already been commented on and emphasis has been laid on the desirability of adding to its store, on both chemical and physical grounds. The percentage of nitrogen, as might be expected under the circumstances, is quite low and the aim should be towards increasing it through organic forms (manure, the turning under of green crops, fish waste, etc.), rather than by application of the more soluble forms, such as nitrate of soda or sulphate of ammonia.

The phosphoric acid percentages—both 'total' and 'available'—are very small and a favourable response to phosphate fertilizers might well be expected. Among such fertilizers we should consider basic slag the most desirable for soils of this type.

The potash is similarly low and we have in consequence to emphasize the desirability of including special potassic fertilizers *e.g.*, wood ashes, sulphate and muriate of potash, in any scheme for the general improvement of the soil.

The amount of lime extracted with strong acid is exceedingly small and that which would be available for crop use is practically negligible. Lime may be furnished in one or more of many forms, but it would not be wise to use large amounts of quicklime unless the soil were well manured or following the turning under of a good growth of some green crop. Wood ashes, in addition to it being a valuable potassic fertilizer

is one of the most acceptable forms for supplying this element. If basic slag were used, as suggested in a preceding paragraph, there would be no need possibly for a special application of lime, as this fertilizer contains a fair quantity in a state or combination that is very useful agriculturally. Marl and ground limestone also suggest themselves as sources of lime useful on such soils.

A word of caution must be given with respect to the use of quicklime on poor soils. Though a response may be obtained at the outset, the continued or excessive employment of this material will bring disappointment unless at the same time the soil is generally enriched, as through manuring and the adoption of a rational rotation. These soils stand in need of lime, but they are also otherwise poor, and if lime only is used, the immediate return is at the expense of the soil's fertility and impoverishment rather than enrichment results.

Laby. No. 8760.—Although in certain particulars this soil is not equal to No. 8758, notably in containing less nitrogen and phosphoric acid, it is on the whole to be regarded as distinctly superior for many farm crops. Its organic matter is more humified and more intimately incorporated with the mineral components and it is in consequence more homogeneous and better adapted to the retention of moisture and to the favourable extension and development of the root system. The absence of such a large proportion of stone and rock fragments as characterizes No. 8758, and the larger clay content of this sample are in its favour. It is a soil that should prove very satisfactory under intelligent cultivation.

There are not any marked or particular deficiencies, so far as can be learned from the chemical data, though with improvement by manures and the increase of its organic content, the rational use of fertilizers would in all probability prove profitable. As a source of phosphoric acid the indications are that basic slag would be suitable. The desirability of organic manure was mentioned in discussing the physical data, and such manures would no doubt be the best forms to introduce nitrogen.

For a soil of this type we should consider the lime content too low for the best returns. An occasional liming might therefore, be recommended, as tending to the improvement of tilth, the promotion of nitrification and the supplying of plant food, directly and indirectly. Any of the forms of this amendment previously mentioned could be used.

Laby. No. 8761.—In colour and general appearance this soil is not unlike No. 8760; closer examination, however, shows it to contain a considerable proportion of gravel absent in the sample just discussed. In many of the chemical data—as in organic matter, nitrogen, insoluble mineral matter, oxide of iron and the amounts of 'available' phosphoric acid and potash, these two soils show a very strong similarity. It however proves to be much poorer in 'total' phosphoric acid, indicating that the stores of this element will require replenishing at an earlier date. A further feature in which it differs from No. 8760, is its greater poverty in lime and hence the greater improvement that may be expected from liming, provided this is judiciously accomplished.

SOILS FROM WARD 1, CORNWALLIS, KINGS CO., N.S.

No. 1. Woodside Farm.—From centre of big orchard, south of big barn. In the air-dried condition this sample was of a dull or chocolate-red colour. It is essentially a coarse-grained sand, with some pebbles and small quartz fragments. The masses of agglutinated sand particles are quite friable, being readily crushed between thumb and finger. The proportion of clay and silt is very small. There is but little evidence of vegetable debris. Reaction: very slightly acid.

No. 2. Woodside Farm.—From directly northwest of big barn. Very similar in colour and general structure to No. 1, but a somewhat coarser soil with apparently a large proportion of gravel. Reaction: very faintly acid.

No. 3. Woodside Farm.—From directly northeast of big barn. A coarse-grained, reddish sandy loam with some large pebbles or rock fragments. Very little clay or silt. Reaction: very faintly acid.

No. 4 Blomidon Farm.—From northeast orchard. A comparatively fine-grained, reddish, sandy loam, with no pebbles. Very friable, with very little clay or silt. Some little root fibre present. Reaction: very slightly acid.

No. 5. Habitant Farm.—From field south of railway track. A reddish, coarse-grained sandy loam, with some lumps of grey sand and a few pebbles and rock fragments. Friable. Very little root fibre present. Reaction: distinctly acid.

No. 6. Habitant Farm.—From Lee Kinsmen's field north of road. A reddish sandy loam. Sand both coarse and fine-grained, but no gravel or pebbles. Apparently no root fibre. Not quite so friable as preceding samples, possibly owing to presence of slightly more clay. Reaction: distinctly acid.

No. 7. Habitant Farm.—From orchard south of big barn.—Light chocolate-red sandy loam with some pebbles. Lumps or masses not quite so friable as in many of the other samples, probably owing to slightly more clay. Little evidence of organic debris. Reaction: distinctly acid.

The air-dried soils were prepared by first removing pebbles and rock fragments and then gently crushing and sifting the remainder, the fine portion (less than ·5 mm.) being submitted to analysis.

Analysis of (air-dried) Soils from Ward 1, Cornwallis, Kings Co., N.S.

No.	Laby. No.	Moisture.	Organic and Volatile Matter.	Nitrogen.	Available Constituents.		
					Phosphoric Acid.	Potash.	Lime.
		per cent	per cent	per cent	per cent	per cent	per cent
1	13267	·88	4·60	·112	·043	·0158	·015
2	13268	·90	4·20	·105	·053	·0135	·021
3	13269	·72	3·24	·077	·040	·0125	·009
4	13270	1·03	5·05	·137	·043	·0048	·007
5	13271	1·40	5·46	·119	·024	·0056	·021
6	13272	1·13	5·58	·150	·021	·0063	·091
7	13273	1·12	5·12	·141	·047	·0094	·058

Physical characters and analytical data alike indicate that all these soils are of the same type or class, and that the differences between them are rather those of degree than of kind. They are sandy loams, the sand for the most part being coarse. Though many contain pebbles and rock fragments, none of the samples could be termed gravelly. Clay and silt are present only in very small proportions and in consequence the soils are free working, open and friable. No doubt in the many years of cultivation the finer particles have washed and worked down into the subsoil.

The amount of vegetable matter (humus) might with advantage be increased in all the soils, both for improving tilth and moisture-holding capacity as well as to form a storehouse for organic nitrogen, a very important element in which these loams are only moderately rich. Organic manures would be the first desideratum towards the permanent improvement of these soils. If barnyard manure is not available in sufficient quantities, the humus-forming material must be furnished by practising a comparatively short rotation, putting the land in grass with clover for, say, two years out of five. If the land is in orchard, legumineus cover crops must be

grown, which will enrich the soil not only in organic matter but in the equally needed nitrogen.

Secondly, the very low lime-content leads to the conclusion that an application of lime or finely ground limestone would be beneficial, and we should strongly advise one or other as an economical means of raising the productiveness of these soils.

Judging from the amount of 'available' phosphoric acid present, there does not seem to be any immediate need of a phosphatic fertilizer. If, however, it is decided to use such we would recommend a trial with basic slag, which, considering the nature of these soils, would appear to be the most suitable form in which to apply this element. The percentages of 'available' potash are not so satisfactory as those of phosphoric acid and indicate that a remunerative response might be obtained from an application of a potassic fertilizer for fruit and root crops.

With respect to soluble nitrogen (nitrate of soda, sulphate of ammonia) an application of, say, 100 to 150 lbs. per acre, in the spring, would probably be advantageous for grain and garden crops, but for orchard work we should consider bone meal (which also furnishes phosphoric acid) a more desirable form.

FERTILIZING MATERIALS.

The official examination of commercial fertilizers sold in Canada is undertaken by the Inland Revenue Department and the Chemical Division of the Experimental Farms does not, therefore, make any analyses of the various brands upon the market, nor engage in any investigation in cases of alleged adulteration of these goods. There are, however, here and there throughout the Dominion, many materials occurring naturally that are of considerable fertilizing value and which, more or less easily obtained, may be used to advantage by our farmers to improve and enrich their lands. These materials comprise certain muds, mucks, marls, sea-weeds, fish refuse, etc., etc. It has been our custom from the first to examine into their value and to advise farmers respecting their economic use, and past reports of this Division contain much information on this important matter.

In the following paragraphs an account is given of a number of these fertilizing materials analysed during the past year, many of them having been sent in by farmers for examination while others have been collected by the Division.

Marl and Limestone.

That many farmers, especially in the Eastern Provinces of the Dominion, are awakening to the fact that there are soils that can be improved by liming, marling or the application of ground limestone, has been noted in our recent reports. The demands for information on this phase of agricultural practice continue to be received and many samples of marl and of rocks supposed to be rich in carbonate of lime have been sent in for examination. To make generally accessible information on the function and uses of lime and its compounds in agriculture an article treating of the subject in its various phases was written for the 1913 report of this Division. As copies of this report are still available, it will be unnecessary to repeat, *in extenso*, our recommendations and advice in this matter. The following paragraphs, however, have been specially written to present succinctly the salient points, and they may give sufficient information to meet ordinary cases. We shall always be pleased, however, on application, to supplement, as far as may be practicable, the particulars therein given and to make suggestions for specific cases.

Lime compounds.—Quicklime, slaked lime and carbonate of lime, though not classed as fertilizers, perform certain useful functions in the soil, the chief of which

may be summarized as follows: They furnish lime (which is an element of plant food) in a more or less available form and consequently are valuable for soils, naturally deficient in this constituent, as well as for soils that have lost their lime by long-continued cropping. They neutralize the acidity of low-lying, ill-drained soils and soils over-rich in organic matter, such as peat and muck soils; few farm crops thrive in an acid or sour soil. They promote nitrification of the humus of the soil and thus increase the amount of available nitrogen, the dominant element in crop growth. They act on the inert potash compounds of the soil, setting free this element and thus encouraging clover and other potash-loving plants. They also exert an influence on the insoluble phosphates of the soil, especially those of iron and alumina, converting them into forms more readily utilized by crops. They improve the texture of heavy clay soils, making them mellower.

The compounds, quicklime, slaked lime and carbonate of lime differ in their composition and hence in their agricultural value. On the basis of an equal purity, 100 lbs. quicklime is the equivalent of 130 lbs. slaked lime and of 180 lbs. carbonate of lime. In other words, it would require 2,600 lbs. slaked lime or 3,600 lbs. of carbonate of lime (marl, ground limestone) to furnish the lime and do the same chemical work in the soil as 2,000 lbs. of quicklime.

The rate of application per acre will depend on several factors—the character of soil, degree of its acidity, etc., but it may be stated as a general principle that on light and poor sandy loams the dressings should be small, say from 500 lbs. to 1,500 lbs. per acre of quicklime—the equivalent of (about) 900 lbs. to 2,700 lbs. of carbonate. On heavy clay loams and on soils rich in vegetable matter heavier applications may be made, say from 1,000 lbs. to 4,000 lbs. quicklime—the equivalent of 1,800 lbs. to 7,000 lbs. carbonate of lime. In considering the amount, the frequency of the application must be borne in mind. It is undoubedly better to give small and frequent dressings than large ones at long intervals. Under ordinary conditions even when a soil responds well to liming, from 5 to 10 years should be allowed to elapse betweeen dressings.

While excessive amounts of quicklime, or its too frequent application, may do postive harm, no danger to soil or crops need be apprehended from large dressings of marl or ground limestone. Quicklime and slaked lime are probably best applied in the autumn, marl and ground limestone may be put on the land at any season.

Quick lime, known commonly as stone lime, is somewhat inconvenient and disagreeable to apply unless it can be bought in a ground condition and distributed with a fertilizer drill or lime spreader. Without special means for distribution the best plan is to put the lumps of lime in small heaps, say of 50 to 75 lbs. each, placed at intervals, according to the rate of application, on the ploughed soil. Over each heap pour slowly a little water, say 2 to 3 gallons, and cover with soil. When the lime is thoroughly slaked, the fine powder may be mixed with more soil, scattered and at once well harrowed in. Crushed marl and ground limestone offer no difficulties in their application. Uniformity in the distribution of all these lime compounds is desirable and since there is a tendency for the lime to wash down, they should not be ploughed under but spread on the surface and harrowed in, as already described.

The use of lime entails the constant supplying of organic humus-forming matter to the soil if fertility is to be maintained.

Lime alone must lead to a soil's impoverishment and in time to its exhaustion below the point of profitable cultivation. In a system that is periodically adding to the soil's store of vegetable matter, as by the regular application of farm manures and the adoption of a rational rotation whereby plant residues are returned, the occasional application of lime in one or other of these forms may be found desirable and profitable.

Laboratory No. 11213.—From Mount Carmel, Antigonish Co., N.S.; occurs as a large bed or deposit; moderately soft and of a reddish-grey or yellowish colour and

in appearance like a semi-disintegrated limestone or other calcareous rock; in powder and lumps.

Analysis.

Moisture	.23
Mineral matter insoluble in acid	13.10
Carbonate of lime	81.75
Sulphate of lime	.58
Organic and volatile matter*	1.02
Undetermined	3.34
	100.00
*Containing nitrogen	.05

This material is essentially carbonate of lime, and if crushed or powdered, could be used effectively as an amendment for all soils in need of lime. It should prove of particular value for the heavy soils mentioned by our correspondent as occurring in the neighbourhood.

Laboratory Nos. 12351-2.—These are samples of crushed limestone from English quarries, submitted for analysis by a Canadian correspondent who states that these limestones could be purchased for export at about 50 cents per cask of 400 lbs. and that the ocean rate would be about $3.50 per ton.

Analysis.

	No. 12351 "B" Monks Park.	No. 12352 "G" Portland Quarries.
Carbonate of Lime	96·07	96·52
Mineral matter insoluble in acid	·50	3·30
Undetermined	3·43	·18
	100·00	100·00

As regards lime content there is little difference between these samples; both are of excellent quality. As an agricultural source of lime, however, their use would be prohibited by reason of their high cost to Canadian farmers.

Laboratory No. 13753.—Marl from bed at Lower West River, Antigonish Co., N. S., in powder and lumps of rock fragments and has the appearance of weathered and disintegrated limestone.

Analysis.

Moisture	·17
Carbonate of Lime	81·00
Mineral matter insoluble in acid	14·94
Loss on ignition (organic matter)	·69
Undetermined	3·20
	100·00

It is essentially carbonate of lime, and if reduced to powder would assuredly prove a valuable amendment on soils requiring lime.

Laboratory No. 14102.—From Clydesdale, Antigonish Co., N.S. In powder and lumps of considerable hardness; resulting probably from disintegration of rock.

Analysis.

Moisture	3·81
Carbonate of lime	85·00
Mineral matter insoluble in acid	8·54
Loss on ignition (organic matter, etc.)	·18
Undetermined	2·47
	100·00

This is a calcareous deposit of fair quality. For its greater efficiency, however, crushing the whole to a condition of coarse powder is necessary.

Laboratory No. 16278.—Marl from Muldoon, Que.; stated to exist in very large quantities as a bed in an old lake bottom. Received as a putty-like substance of a light-grey colour and showing a large number of shells. It dries to an easily crumbled mass of a dark-grey, earthly appearance. It is almost entirely soluble in dilute hydrochloric acid, with brisk effervescence. This examination shows it to be marl of very good quality; it contains very little foreign matter. It would undoubtedly prove an effective source of lime for all classes of soils.

Laboratory No. 16523.—From Armstrong, B.C. Greyish-white, granular, almost completely soluble with brisk effervescence in dilute acid. This is a calcerous deposit of very considerable agricultural value. It consists essentially of carbonate of lime and is probably derived by deposition from waters rich in that constituent. The percentage of foreign matter in the deposit is very small.

Laboratory No. 16525.—Also from the neighbourhood of Armstrong, B.C. This, though containing a fair percentage of carbonate of lime, is distinctly inferior to No. 16523, there being present a large proportion—approximately fifty per cent—of inert mineral matter.

Laboratory No. 16534.—From Shuswap, B.C. This material, described as a 'white sandy deposit' occurs as a bed near a pond and is covered with about a foot of soil. As received it was of greyish-white colour, of earthy appearance and quite friable. It dissolves completely and readily in dilute acid with brisk effervescence, and furnishes evidence of being essentially carbonate of lime. It is to be considered a marl of excellent quality.

Laboratory No. 16904.—From Enderby, B.C., stated to occur as a deposit resulting from the evaporation of seepage water passing through strata of calcareous rock.

Analysis.

Moisture	7·75
Organic and volatile water	2·03
Mineral matter insoluble in acid	32·07
Oxide of iron and alumina	1·76
Carbonate of lime	55·46
Sulphate of lime	·25
Phosphoric acid	traces.
Undetermined	1·48
	100·00

This material, air-dried, it will be seen, contains only a little more than half its weight of carbonate of lime and therefore cannot be classed as a marl of high quality.

It could, however, be used to advantage on sour soils and those naturally deficient in lime—indeed on all soils needing that element—provided it were cheaply obtained.

Laboratory No. 14481.—A 'calcareous clay' from Vittoria, Ontario. The correspondent writes 'There is a deposit of this material of about 18 inches covering about 20 acres at the foot of a hill and through which runs a small stream of water. It has evidently been a swamp.'

Analysis.

Carbonate of lime	62·25
Clay, sands, etc. (insoluble in acid)	32·22
Oxide of iron, etc., by difference	5·53
	100·00

We might predict that this 'clay' would be useful to sour soils and those deficient in lime; it is not, however, of first quality, considered as a source of lime.

Laboratory No. 13969.—A 'calcareous deposit' from Hedley, B.C., and forwarded for information as to its use and value in agriculture.

Analysis.

Carbonate of lime	14·02
Sulphate of lime	77·27
Clay, sand, etc. (insoluble in acid)	32·22
Undetermined	5·31
	100·00

This deposit is a mixture of sulphate and carbonate of lime, the former predominating. Sulphate of lime or gypsum has an agricultural value, chiefly, probably, in liberating potash from its inert stores in the soil, and has been found of especial value for clover, a potash-loving crop. Though the percentage of carbonate of lime is not large, it is sufficient to make the deposit of value for the correcting of sourness of poorly drained soils. The application might be from 1,000 to 3,000 lbs. per acre.

Laboratory No. 15051.—Described as 'rock deposit' from Saanich Peninsula, B.C., and occurring as a bed or deposit of decomposed material overlying limestone.

Analysis.

	Per cent.
Mineral matter insoluble in acid	57·84
Oxide of iron and alumina	24·92
Lime	2·41
Magnesia	2·84
Potash	trace.
Phosphoric acid	"

This deposit cannot be considered of any agricultural value, the lime content being too small to make the material of use as an amendment for sour soils, and the potash and phosphoric acid being present in traces only.

Laboratory No. 14195.—'Grey limestone' from J. F. H., Buckingham, Que. Received in the form of a fine powder, with a request for information as to its value for agricultural purposes.

Analysis.

Carbonate of lime	91·30
Mineral matter insoluble in acid	1·70
Oxide of iron, alumina, etc. (undetermined)	7·00
	100·00

This is a limestone of good quality and the degree of fineness to which it has been ground enhances its agricultural value from the standpoint of availability.

Laboratory No. 16888.—'Ground limestone' from E. L. Co., Sydney, Cape Breton, N.S., and forwarded for report as to composition and fineness.

Analysis.

Carbonate of lime	92.00
Mineral matter insoluble in acid	6.15
Oxide of iron and alumina	1.56
Undetermined	.29
	100.00

These results indicate a limestone of excellent quality. The mechanical separation gave the following data:—

20.05 p.c.	passes	through	sieve	having	80	meshes	to linear inch.
27.10 p.c.	"	"	"	"	40	"	"
35.81 p.c.	"	"	"	"	20	"	"
48.93 p.c.	"	"	"	"	10	"	"
72.16 p.c.	"	"	"	"	5	"	"

Apparently this is coarser than much of the ground limestone used in the United States. We may conclude that the finer the grinding the more immediate will be the action of the limestone in the soil; on the other hand, it seems probable that a fairly coarse powder has an advantage in the majority of cases, for though slower, it will remain active in the soil for a longer period of years.

Laboratory No. 16146.—W. McD., Sussex. Limestone from Havelock, Kings Co., N.B., forwarded with an inquiry as to its value for grinding and use in agriculture.

Analysis.

Carbonate of lime	94.92
Oxide of iron and alumina	.60
Mineral matter insoluble in acid	2.24
Carbonate of magnesia, etc. (by difference)	2.24
	100.00

A limestone of excellent quality and, in pulverized form, one eminently suitable for agricultural purposes.

Laboratory Nos. 14155-6.—Two samples of 'waste lime' from Randolph, N.B., and forwarded by W. W. H., Fredericton, with an enquiry as to their respective values for use on the land; probably occurring as refuse from lime kilns.

Analysis.

	No. 14155. "Blue Rock." Per cent.	No. 14156. "Magnesia." Per cent.
Carbonate of lime	34.23	25.73
Caustic and slaked lime	43.45	30.67
Mineral matter insoluble in acid	1.50	.19
In fine powder (passing through .5mm. mesh)	58.60	48.22
In coarse powder and lumps	41.40	51.78

Both samples would be valuable for agricultural purposes but No. 14155 is the better by reason of its larger lime-content and its finer condition.

Laboratory No. 14177.—'Agricultural Lime.' V-V. L. and B. Co., Victoria, B. C. In the form of a very fine white powder and specially recommended for agricultural use. Occurring probably as a waste product in the burning of lime.

Analysis.

Carbonate of lime	67.34
Caustic and slaked lime	21.73
Mineral matter insoluble in acid	4.97
Oxide of iron, etc. (undetermined)	5.96
	100.00

It is, undoubtedly, a useful source of lime for the treatment of soils and one from which good results might be expected.

Laboratory No. 16845.—'Agricultural Lime.' E. H., Agassiz, B.C. A very fine and fluffy powder. Its source of manufacture could not be learned, but it is probably the waste lime from kilns.

Analysis.

Carbonate of lime	48.75
Caustic and slaked lime	44.60
Mineral matter insoluble in acid	.22
Oxide of iron, alumina, magnesia, etc. (by difference)	6.43
	100.00

From its composition as well as its physical condition, this should prove an excellent lime for agricultural purposes.

Superphosphate of Lime.

Laboratory No. 16794.—Sample forwarded from the Agricultural College, Truro, N.S., and labelled 'Superphosphate of Lime containing soluble phosphates 36 per cent.' From the United Alkali Co., Ltd., Pilkington Works.

Our analysis showed total phosphoric acid 19.13 per cent, water-soluble phosphoric acid, 16.09 per cent.

If all the phosphoric acid in a material containing 36 per cent phosphate of lime were made soluble, the percentage of water-soluble phosphoric acid so produced would be 16.99 per cent. It seems evident, therefore, that the manufacturers statement on the label is to be construed as meaning that the superphosphate contains water-soluble phosphoric acid equivalent to 36 per cent bone or rock phosphate.

Wood Ashes.

Laboratory No. 13175.—J. McC., Valcartier, Que. Purchased in the vicinity and forwarded for examination as to fertilizing value. Received in air-dried condition.

Analysis.

Moisture	1.04
Mineral matter insoluble in acid (sand, clay, etc.)	41.43
Organic and volatile matter (charcoal, etc.)	17.80
Oxide of iron and alumina	20.96
Lime	10.14
Magnesia	.77
Potash	2.76
Soda	1.08
Phosphoric acid	1.10
Carbonic acid, etc. (undetermined)	2.92
	100.00

These ashes are decidely low in potash, the chief fertilizing element in materials of this character. In commercial wood ashes of fair quality, the potash is usually between 5 per cent and 6 per cent. It therefore would seem that these ashes have been partially leached or mixed with a good deal of sand, etc.

Laboratory No. 16648.—'Soft Maple Ashes' from C. P. M., Sardis, B.C. Sample consists of powder and a number of vitrified masses or clinkers.

Analysis.

	Per Cent.
Potash	19.19
Phosphoric acid	2.71
Lime (existing chiefly as carbonate)	35.76
Mineral matter insoluble in acid	3.16

These ashes contain an unusually high percentage of potash and are, in consequence, of very considerable fertilizing value. They are practically free from sand or other foreign material and are to be regarded rather as the 'pure ash' of the maple than as a commercial article.

Sewage Sludge or Poudrette.

This sample (*Laboratory No. 16273*) was submitted to analysis at the request of the Commission of Conservation, it having been obtained from Manchester, England.

In various systems of sewage purification by precipitation, a product is obtained from the settling vats or reservoirs, which is generally known as sludge. The composition of this material will, naturally, vary with the concentration of the sewage, the nature and amount of the precipitant (lime, alum, etc.), and the degree to which it is subsequently dried; hence the fertilizing value is a matter of close inquiry.

Analysis.

	Per Cent.
Moisture	3.18
Organic and volatile matter	33.06
Mineral matter	63.76
	100.00
Clay, sand, etc., insoluble in acid	45.12
Oxide of iron and alumina	9.81
Lime	2.03
Phosphoric acid	1.22
Potash	.08
Nitrogen, in organic matter	1.45

For the purpose of comparison, analyses of sludge from Hamilton and Toronto, made in the Farm laboratories some years ago, are appended.

Analyses of Sludge.

	Hamilton. Per Cent	Toronto. Per Cent.
Moisture	31.75	3.94
Organic and volatile matter	39.05	40.91
Mineral matter	39.20	55.15
	100.00	100.00
Clay, sand, etc., insoluble in acid	9.66	34.05
Oxide of iron and alumina	4.74	13.65
Lime	9.23	2.07
Magnesia	10.40	.33
Phosphoric acid	.69	1.24
Potash	.19	.21
Nitrogen, in organic matter	.84	2.04

Their chief element of fertilizing value is nitrogen; of the other essential constituents of plant food, the percentages are quite small. It will be evident from a study of these data that this material cannot be ranked with commercial fertilizers, though it undoubtedly possesses a manurial value. It may be questioned if its plant food content would warrant its carriage for long distances, but as supplemental to other manures it could be used locally to advantage.

Sludge and poudrette, it is claimed, have a value from the biological standpoint. They are said to be rich in the nitrifying organisms necessary for the conversion of soil nitrogen into nitrates, the form in which farm crops obtain their nitrogenous food. It is probable, therefore, that the beneficial results obtained from the use of these materials may in part be due to the presence of these micro-organisms.

Flue Ashes.

Laboratory No. 16805.—From B. M. S., Louisburg, C. B., N.S. Though labelled 'Soot,' an examination shows clearly that this material is rather of the nature of flue ashes—a conclusion confirmed by the analytical data.

Analysis.

	Per Cent.
Moisture	1·75
Organic and volatile matter	8·95
Mineral matter	89·30
	100·00
Nitrogen	·20
Phosphoric acid	·14
Potash[2]	·13

[1] Containing 46·83 per cent insoluble in acid.
[2] Containing ·032 per cent soluble in water.

The fertilizing value of this material is very small, practically negligible. Though not furnishing much plant food, it is possible that it might be found helpful for heavy soils, making them mellower and more easily worked.

Pulp Mill Refuse.

Laboratory No. 16836.—From Pont St. Maurice, Que., and stated to be the refuse or waste in the manufacture of pulp by the sulphite process.

As received, it was a dark-grey, jelly-like substance, smelling strongly of sulphuretted hydrogen and very strongly alkaline. On standing there was a separation into two layers, the upper a pale-yellow fluid, the lower a dark-grey, semi-solid mass. An examination of the sample as a whole showed that potash was present in traces only, and that the lime, which was abundant, was chiefly as sulphide and therefore could not be utilized for the treatment of soils in need of that element. The caustic character of the refuse entirely precluded its employment on the land.

FERTILIZER EXPERIMENTS WITH POTATOES.

The use of fertilizers in the Maritime Provinces has been steadily increasing for some years past, especially for the potato crop. Though some farmers have done a little experimental work to ascertain the forms and amounts of the fertilizers most likely to prove profitable, the larger number are practically working in the dark, knowing little as to the deficiencies of their soil, the requirements of their crop or the cheap-

est and most available forms in which to furnish plant food as fertilizers. In order to investigate the relative merits of various forms and applications of fertilizers for the potato crop under the particular conditions of soil, climate, etc., obtaining at Fredericton, N.B., and Kentville, N.S., land was set aside, in the spring of 1913, at the Experimental Stations at these respective places, and a more or less comprehensive plan, including the use of the various forms of nitrogen, phosphoric acid and potash commonly found in fertilizers, inaugurated. The field work has been under the control of Mr. W. W. Hubbard, Superintendent at Fredericton and Mr. W. Saxby Blair, Superintendent at Kentville, to whom I am indebted for the data and records given in this report.

Experiments at Fredericton, N.B.

Fifteen plots of one-tenth acre (A to O) and three of one-half acre each (P. Q. and R.) were measured off. The series included three check plots, upon which no fertilizer was applied.

The soil was rather light sandy loam, fairly uniform in character and apparently well drained naturally. For many years it had been in hay and the last previous manuring had been two or three years prior to this experiment. In October, 1912, it had been ploughed and during the first week of May, 1913, it was thoroughly worked with the disc harrow. This was followed by cultivation continued every ten days until the time of planting. Shallow furrows were then opened up 30 inches apart and to a depth of 3½ inches.

The fertilizer was distributed by hand as evenly as possible along the bottom of the furrows and lightly covered with soil. Commercial New Brunswick White Stock potatoes were used as seed and planting was done on June 19th.

Throughout the season due attention was given to the proper cultivation of the crop, which was twice sprayed with Bordeaux mixture and Arsenoid. The vines were killed by frost on September 28th, but digging had to be deferred until October 23rd, owing to continued wet weather, which, however, did not adversely affect the crop.

In Table I the various fertilizers and the amounts applied per acre are given, together with the total and marketable yields of potatoes obtained. Net results after deducting the cost of fertilizer have been calculated, valuing the marketable tuber at 44 cents and the culls at 20 cents, per bushel, thus showing the gains and losses per acre from the use of fertilizers throughout the series.

Experiments at Kentville, N.S.

This series comprised twenty-four plots of 1/30 acre each and included four to which no fertilizer was applied, to serve as checks.

The land had never been cropped and was only cleared of stumps the previous season, many roots still remaining. The soil was a sandy loam of medium to poor quality, but fairly level and uniform.

The fertilizer was broadcasted evenly by hand and harrowed in just before planting. A uniform strain of Green Mountain potatoes was used for seed. The rows were 33 inches apart. Planting was on June 6. Cultivation was given as necessary and the crop was twice sprayed with Bordeaux mixture and Paris green. At the close of the season the 'stand' appeared to be exceptionally even. The crop was dug September 30. The data and calculations therefrom, similar to those given for Fredericton, are presented in Table II.

TABLE 1.—Fertilizer Experiments on Potatoes at Fredericton, N.B.

Plot.	Nitrate of Soda.	Sulphate of Ammonia.	Bone Meal.	Superphosphate.	Basic Slag.	Sulphate of Potash.	Total Yield.	Marketable.	At 44 cts. Bushel.	Cost of Fertilizer.	No Allowance for Cells.		Including Cells Valued at 20 cts. Bushel.	
											Net Receipts.	Profit Over no Fertilizer (861 60).	Net Receipts.	Profit Over no Fertilizer (867 07).
							Bush.	Bush.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
A	75	75	250	250	...	150	322	304	133 76	14 78	118 98	57 38	122 58	55 51
B	75	75	...	...	500	150	311	291	128 04	12 53	115 51	53 91	119 51	52 44
C	150	...	...	...	...	...	200	172	75 68	4 88	70 80	9 20	76 40	9 33
D	...	120	...	...	...	...	224	192	84 48	3 90	80 58	18 98	86 98	19 91
E	...	...	...	...	...	...	176	144	63 36	...	63 36	...	69 76	...
F	...	...	...	350	...	...	172	140	61 60	3 50	58 10	Loss.	64 50	Loss.
G	...	...	...	...	500	...	148	116	51 04	3 75	47 29	Loss.	53 69	Loss.
H	...	...	...	...	...	150	220	196	86 24	3 90	82 34	20 74	87 14	20 07
I	75	75	...	350	...	...	172	132	58 08	8 38	49 70	Loss.	57 70	Loss.
J	75	75	...	...	500	...	160	120	52 80	8 63	44 17	Loss.	52 17	Loss.
K	...	...	...	...	...	...	134	108	47 52	...	47 52	...	52 72	...
L	75	75	...	...	...	150	241	220	96 80	8 78	88 02	26 42	92 22	25 15
M	...	...	...	350	...	150	227	198	87 12	7 40	79 72	18 12	85 52	18 45
N	...	...	...	...	500	150	195	179	78 76	7 65	71 11	9 51	74 31	7 24
O	(Lime, 2,000 lbs.)				...	...	192	171	75 24	12 00	63 24	1 64	67 44	0 37
P	75	50	...	50	200	100	315	294	129 36	8 67	120 69	59 09	124 89	57 82
Q	75	50	...	50	200	60	320	300	132 00	7 63	124 37	62 77	128 37	61 30
R	75	50	...	50	200	30	299	265	116 60	6 85	109 75	48 15	116 55	49 48
S	...	...	...	...	...	...	192	168	73 92	...	73 92	...	78 72	...

NOTE. The check plots (no fertilizer) are E. K. and S.

TABLE II.—Fertilizer Experiments on Potatoes at Kentville, N.S.

Plot.	Nitrate of Soda.	Sulphate of Ammonia.	Bone Meal.	Superphosphate.	Basic Slag.	Sulphate of Potash	Total Yield.	Marketable.	At 44 cts. Bushel.	Cost of Fertilizer.	No Allowance for Culls.		Including Culls Valued at 20c. Bushel.	
											Net Receipts.	Profit over no Fertilizer ($58.14).	Net Receipts.	Profit over no Fertilizer ($63.91).
							Bush.	Bush.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1	150	.....	.....	350	.....	150	213·5	179·5	78 98	12 28	66 71	8 57	73 51	9 60
2	150	.....	.....	.....	500	150	202·	169	74 36	12 53	61 84	3 70	68 44	4 53
3	150	.....	500	.....	.....	150	259	221·5	97 46	15 78	91 69	23 55	98 19	25 28
4	.....	150	.....	350	.....	150	294·5	259·5	114 18	12 28	101 91	43 37	108 91	45 00
5	150	.....	.....	350	.....	100	209·5	172·5	75 90	10 98	64 93	6 79	72 33	8 42
6	.....	.....	.....	.....	.....	.....	151	122·	53 68	.....	53 68	.....	59 48	.....
*7	150	.....	.....	350	.....	150	250·5	221·5	97 46	7 56	89 91	31 77	95 51	31 60
†8	150	.....	.....	350	.....	150	263	237·5	104 50	11 33	93 17	35 04	98 27	34 36
9	150	.....	.....	350	.....	60	253·5	213·	93 72	9 93	83 79	25 66	91 89	27 98
10	150	.....	.....	.....	.....	.....	215	183	80 52	4 88	75 65	17 51	82 05	18 14
11	.....	.....	.....	.....	.....	.....	151·5	123	54 12	.....	54 12	.....	59 82	.....
‡12	150	.....	.....	350	.....	150	285	252·5	111 10	15 11	94 99	36 86	101 49	37 58
13	150	.....	.....	350	.....	30	197·5	164	72 16	9 16	63 01	4 87	69 71	5 80
14	.....	.....	.....	.....	.....	.....	154 5	122	53 68	.....	53 68	.....	60 18	.....
15	.....	.....	.....	.....	.....	150	162·5	136.5	60 06	3 90	56 16	Loss.	61 36	Loss.
/16	150	.....	.....	350	.....	150	265·5	237	104 28	11 75	92 53	34 40	98 23	34 32
17	.....	.....	.....	350	.....	.....	186·5	150·5	66 22	3 50	62 72	4 59	69 92	6 01
18	.....	.....	500	.....	.....	.....	234	202·5	89 10	7 00	82 10	23 97	88 40	24 49
19	.....	.....	.....	.....	.....	.....	187	161·5	71 06	.....	71 06	.....	76 16	.....
20	.....	.....	.....	350	.....	150	195·5	162	71 28	7 40	63 88	5 75	70 58	6 67
21	.....	.....	.....	.....	500	.....	194·5	160	70 40	3 75	66 65	8 52	73 55	9 64
22	150	.....	.....	.....	500	.....	232	196·5	86 46	8 63	77 83	19 70	84 93	21 02
23	150	.....	.....	.....	.....	150	223·5	195·	85 80	8 78	77 03	19 89	82 73	18 82
24	150	.....	.....	350	.....	.....	200·5	165·6	72 82	8 38	64 45	6 31	71 45	7 54

*(Mixed and applied at rate of 400 lb. per acre.) †(Mixed and applied at rate of 600 lb. per acre.) ‡(Mixed and applied at rate of 800 lb. per acre.)
/(Potash as Muriate.)

NOTE.—The check plots (no fertilizer) are Nos. 6, 11, 14 and 19.

It would not be wise to draw hard and fast conclusions from one year's work, but a careful consideration of the data in the foregoing tables shows that there are a few inferences, broad and fundamental in character, that may be safely and legitimately made. To present these deductions in a form that may be readily grasped, Table III has been prepared. It gives for each series, the data for the plot showing the net maximum cash receipt, from which is subtracted the average value of the crop without fertilizers. The table allows of deductions respecting the increases in profit from the use of fertilizers in general. It also furnishes interesting and valuable figures representing the respective profits and losses from the employment of any one element, any two elements and from the use of all three elements in the formula.

TABLE III.—PROFIT AND LOSSES FROM USE OF FERTILIZERS.

	FREDERICTON, N.B.		KENTVILLE, N.S.	
	Marketable.	Total.	Marketable.	Total.
	$ cts.	$ cts.	$ cts.	$ cts.
Maximum net receipts	124 37	128 37	101 91	108 91
Average from check plots without fertilizer	61 60	67 07	58 14	63 91
Maximum net increase ($) due to fertilizer	62 77	61 30	43 77	45 00
Maximum net increase (p.c.) " "	101·9	91 40	75·3	70·41
	Profits* p. c.	Losses* p. c.	Profits* p. c.	Losses* p. c.
Using any one element.				
Nitrogen alone	15·0		30 1	
	30·8			
Phosphoric acid alone		5·7	7·9	
		23·2	14·7	
			41·2	
Potash alone	33·7			3·4
Lime alone	2·7			
Using any two elements.				
Nitrogen with phosphoric acid		19 3	10·85	
		28·3	33·9	
Nitrogen with potash	42 9		32·5	
Phosphoric acid with potash	15·4		9·9	
	29·4			
Using any three elements.				
Nitrogen with phosphoric acid and potash	78·15		6·4	
	87·5		8·4	
	93·15		11·7	
	96·0		14·8	
	101·6		40·5	
			45·0	
			54 7	
			59·2	
			60·3	
			63·4	
			75·3	

* Profits and losses have been calculated from the marketable crop only.

Though in the series at Kentville but one case of actual loss from the application of fertilizer occurred there are several instances in which the margin of profit from its use is exceedingly small. At Fredericton four fertilized plots gave no profit, yet on the same area, on apparently similar soil we find several plots upon which

the application of fertilizer has given splendid returns. The profits from the use of fertilizer range from 1 per cent to 101·9 per cent, reckoned on the total value of the crop. This latter gain means a crop worth twice as much as the average from the unfertilized plots, and yet this immense gain, found after deducting the cost of the fertilizer, does not necessarily mark the limits of possibility. It must not be inferred from this that the profit to be derived from the application of fertilizers is a matter of mere chance—it is not—but it will be evident that there is here a problem that must be rationally attacked. In a large number of instances there is a profit to be reaped from the use of fertilizers, the problem is to find out those special forms and their amounts which will yield the maximum profit. There are few other means whereby the intelligent, observant farmer can so readily increase his income; on the other hand, without care and thoroughness and patient investigation the use of fertilizers is fraught with uncertainty. To double a total income from a crop might easily mean to increase four or five fold the net profits from the year's work. The results here recorded, it must be remembered, apply simply to the potato crop, but they show that the study of the rational use of fertilizers fully merits the attention of farmers and particularly of those who are without a sufficiency of manure to maintain fertility and thus unable to obtain maximum yields.

Table III brings out in a striking manner that the largest profits and the largest number of cases giving a profit followed the application of *all three elements of plant food.* Further, where one or two of the elements only were furnished, a moderate profit of only about one-half of that otherwise obtained, is shown, the stand was not so good and the percentage of culls was much higher than when a complete fertilizer was used. As regards healthiness, field notes showed the plants on the complete fertilizer plots were the freer from rust and had in appearance the greater vigor.

A consideration of the detailed data of tables I and II shows that as to forms of plant food, nitrogen gave much the better results when applied, at least in part, as sulphate of ammonia. Phosphoric acid would seem to be equally effective either as superphosphate or basic slag, while applied as bone meal it has proved, apparently, somewhat more valuable. Potash may be applied in either form, muriate or sulphate, with equal results as regards yield.

A further study of the details will make it very apparent that the largest profits do not necessarily follow the application of the largest amounts of fertilizer. It is strikingly noticeable that the largest increase in net profits ($62.77 or 101.9 per cent) was effected by one of the smallest applications in the list,—a total of 435 pounds, at a cost of $6.85—and it is quite possible that these applications might be still further reduced.

FODDERS AND FEEDING STUFFS.

Attention was directed in our last report to the working of the Commercial Feeding Stuffs Act under the operation of the Department of Inland Revenue. This Act requires that certain classes of feeds, more especially those occurring as by-products in manufacturing processes, shall be duly registered and shall bear a label or statement attached to the package giving the registration number and a guaranteed analysis in terms of its minimum content of protein and fat and its maximum content of fibre. Its enforcement has undoubtedly been of considerable protective value to the farmer and incidentally has very considerably reduced the number of miscellaneous samples of feeding stuffs that we have been accustomed to receive from farmers for examination and report.

The accompanying table contains the analytical data of certain fodders and feeding stuffs examined in the Experimental Farm laboratories during the past year. The greater number of these samples are of materials used in feeding experiments at one or other of the Experimental Farms or Stations, but there are several, forwarded by farmers, respecting which there did not appear to be any exact knowledge on record.

Analysis of Feeding Stuffs 1913–14.

Laboratory Number.	Name.	Particulars.	Water.	Crude Protein.	Oil or fat.	Carbo-hydrates.	Fibre.	Ash.
			p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
14664	Cotton seed meal	Owl Brand, Memphis, Tenn	7·16	37·77	7·56	29·93	10·81	6·77
16505	" "	Am. Cotton Oil Co., Jacksonville Fla	8·55	37·15	7·16			
16306	" "	" " Toledo, Fla	10·45	40·41	7·38			
14224	Distillery grains	Melcher's Gin & Spirits Distillery Co. Ltd. Montreal	5·20	19·51	4·39	50·95	17·74	2·21
14670	" "	" " "	7·82	19·16	3·80	50·08	16·45	2·69
15012	" "	" " "	7·38	18·57	6·40	46·48	18·43	2·74
16253	" "	" " "	8·65	19·43	6·30	44·94	17·58	3·10
14663	Brewers "	Farmer's Feed Co., Toronto	9·26	22·67	5·66	42·20	16·43	3·78
16968	Dried distillery slop	H. Walker & Son, Walkerville, Ont	11·01	17·44	9·55	48·84	5·17	7·99
14662	Oil cake	Livingstone Co. Baden, Ont	6·68	31·60	2·01	37·11	17·80	4·80
14665	Gluten meal	Edwardsburg Starch Co	13·20	30·63	4·04	49·71	1·95	0·47
14974	Barley germ meal	Charlesburg, Que	11·22	25·98	2·10	43·50	11·47	5·73
15672	Vetchy pea hay	Birch Hills, Sask	5·08	22·24	4·11	35·90	25·93	6·64
15673	Am. vetch hay	" "	7·17	19·11	3·04	40·57	23·37	6·74
16311	Cocoa bean husks	Agassiz, B. C.	6·44	16·89	11·02	43·33	15·10	8·22
16961	Mixed concentrates	New Westminster, B. C	7·85	14·53	9·61	54·12	7·73	6·16
14706	Wheat middlings	Pollyhurst, N. B	10·76	15·81	4·29	58·04	6·62	4·48
16891	" "	Maple Leaf Milling Co., Kenora	6·83	17·74				4·46
16892	" "	" " "	7·35	16·46				3·71
16 10	Golden flax	Lethbridge, Alta		21·23	41·80			
14661	Bran	Maple Leaf Milling Co., Kenora	11·32	14·84	3·95	54·74	9·68	5·47
14483	Hulless oats	Central Experimental Farm	10·84	15·89	5·00	63·68	2·32	2·27
14660	Molasses	From Louisiana, U. S. A	28·70	4·94		60·95		5·41
15053	" feed	Caldwell's Molasses Feed Co., Dundas	22·04	4·89	0·46	58·22	7·03	7·36
15054	Molassine meal	Molassine Co., E. Greenwich, Eng	17·06	6·34	0·68	58·38	10·55	6·99
16442	Corn fodder	Brandon, Man	48·51	5·38	0·17	21·48	20·03	4·43
16443	" ensilage	" "	77·84	2·29	0·06	9·54	8·31	1·96

Cotton-seed Meal, Laboratory Nos. 14664, 16505, 16506.—This product as found on the market, is very variable. The highest grades contain in the neighbourhood of 40 per cent protein and as much as 13 per cent oil. Many grades may fall considerably below these figures and may also contain an excess of fibre, and thus it is evident that cotton-seed meal should only be purchased on guaranteed analysis.

Sample No. 14664, Owl Brand, was bought locally at Ottawa and was manufactured at Memphis, Tenn., U.S.A. Nos. 16505, 16506, forwarded from Truro, N.S., were from Jacksonville and Toledo respectively. All three are genuine and of good quality, but No. 16506, by reason of its somewhat higher protein content is the best of the series.

Distillers' Grains, Laboratory Nos. 14224, 14670, 15022, 16253.—These dried grains from the distillery are stated to result from the use of malted barley, rye and corn in equal proportions. This is a product of very considerable feeding value, containing nearly 20 per cent of protein and from 4 to 6 per cent of oil or fat. The fibre content is rather high when compared with concentrates such as oil cake and cotton seed meal. The samples reported on were drawn at intervals of several months apart, and, therefore, the close accord of the analyses would indicate a very fair uniformity in the composition of this product throughout the year.

Laboratory No. 16968.—Respecting this sample the manufacturers write 'In the process of drying out ordinary mashes, containing corn, rye, barley, malt and oats, the 'slop', as it leaves the still, is run over a strainer and hitherto only the part which did not go through has been saved. That which passed through has been allowed to run off without any use being made of it. It is this 'thin slop' *dried* that we now send you a sample of, to ascertain its feeding value.' It would appear to be an excellent feeding stuff, containing between 17 and 18 per cent protein and between 9 and 10 per cent fat, with a low fibre content, 5 per cent. In all probability it has a high digestibility, but we cannot speak as to its palatability or keeping qualities.

In addition to the tabulated data, this dried distillery slop was found to contain 3·37 per cent reducing sugars and ·98 per cent non-reducing sugars. It had an acidity equivalent to 9·8 per cent in terms of lactic acid.

Brewers' Grains, Laboratory No. 14663.—This was purchased from the Farmer's Feed Co., Toronto.

This sample conforms to the standard or average for dried brewers' grains. It is considered a valuable feeding stuff in the ration for dairy cows, chiefly in supplying protein in a digestible form.

Oil Cake, Laboratory No. 14662.—This is evidently manufactured by the new process, which means that a larger proportion of the oil is extracted from the flax seed, leaving the cake poorer in this constituent, than by the old process. The average protein and fat content for the new process meal would be 33·0 per cent and 3 per cent respectively, and for the old process 28·1 to 30·0 protein and 9·0 to 10·0 per cent oil.

Oil cake is a highly concentrated feeding stuff, presenting its protein and oil in readily digestible forms. When fed judiciously it can be employed profitably, both in milk and beef production.

Gluten Meal, Laboratory No. 14665.—The product of the Edwardsburg Starch Company, Cardinal, Ont., is in all essential features similar in composition to samples of gluten meal from this company analyzed by us in recent years. The protein content is very satisfactory, but the meal does not contain as much oil as in the product put out some years ago.

This by-product, fed with other grain feeds, and in judicious quantities, has a high nutritive value, more especially for increasing the digestable protein in the ration.

Barley Germ Meal, Laboratory No. 14974.—The manufacturer is stated by our correspondent to be the 'Brassiere Champlain de Quebec.' The analysis shows it to be somewhat richer in protein and poorer in fat than dried brewers' grains, with a lower fibre content than is usually found in this latter feeding stuff and its general feeding value, we presume, would be found slightly superior.

Veiny Pea Hay, Laboratory No. 15672.—Commonly known as Veiny Pea (*Lathyrus venosus* Muhl). This fodder plant was forwarded from Birch Hills, Sask. Our correspondent writes 'this forage plant, with the Pea Vine vetch (Laboratory No. 15672) grows in abundance on newly cleared land, continuing to grow for some years in grain fields. They also grow on bluffs, climbing trees. These vines grow with many wild grasses and are cured for hay. They furnish the first green stuff in the spring and are the last to freeze in the fall. They are relished by all classes of stock. I know of one man, living in the bush, who raises hogs chiefly on these vines.'

The sample as received (September 9), was in the late flowering or fruiting stage, but contained no pods; the length of the vines was about 20 inches. The Dominion Botanist reports it as of doubtful value for economic growth.

The crude protein content is high, even for a leguminous hay, and the fibre is not at all excessive for a roughage of this character. Provided, therefore, that it is found to be palatable it should prove a highly nutritious feed.

American Vetch Hay, Laboratory No. 15673.—Commonly known as Pea Vine (*Vicia Americana* Muhl). This was forwarded with the preceeding sample. It was in the late flowering or fruiting stage, with stems about 18 inches long. It is reported by the Dominion Botanist as of doubtful economic value.

In composition it appears to be slightly inferior to the sample of Veiny Pea, but is nevertheless a rich fodder and in practical feeding work there is probably not much difference in their values.

Cocoa-bean Husks, Laboratory No. 16311.—This sample of cocoa shell or husks was forwarded from the Experimental Farm, Agassiz, B.C., where it was proposed, if found of satisfactory composition, to use this material in a feeding trial with cattle and swine. It is apparently a by-product of the cocoa and chocolate factory. A sample forwarded from Halifax, N.S., in 1898, furnished on analysis figures very similar to those now obtained.

We have no reliable information as to the digestibility of this product as a whole, but we do know that cocoa butter fat is readily assimilated. It is possible, therefore, that this by-product has a high feeding value. If found fairly digestible and palatable it might serve, if finely ground, as an important constituent of the ration, furnishing protein and fat. Its palatability is a point upon which more information is needed, but it would seem probable that 2 pounds or so might be fed daily per head to dairy cows.

Attention may be directed to the richness of this material in fertilizing constituents, the following being the data obtained on this sample. Nitrogen 2.54 per cent; phosphoric acid 1·01 per cent and potash 2·80 per cent. These for the most part would be recovered in the solid and liquid excreta.

'Mixed Concentrates', Laboratory No. 16961.—This feeding stuff was forwarded from New Westminster, B.C., where it could be purchased at $28 per ton, 'oat chop' being sold at $30 per ton. It is stated that the cows relish the feed and seemingly do well on it.

It would seem to be an acceptable feeding stuff, comparing well with bran of good quality as to protein and fibre and decidedly richer in fat than this feeding stuff. As compared with ground or crushed oats, it contains higher percentages of protein and fat and has a lower fibre content, so that it should prove the superior feed.

Middlings, Laboratory No. 14706.—This is stated by our correspondent to have been bought from the T. H. Taylor Company, Chatham, Ont. Its analysis indicates it to be genuine and of good quality.

Laboratory No. 16891-2.—These are wheat middlings, stated to be the output of the Maple Leaf Milling Company, Kenora, Ont. No. 16891 has the somewhat higher protein content and is, therefore, the more valuable, but both would appear to be of excellent quality. The average protein content of middlings as generally found on the market is between 15·5 and 16 per cent.

Golden Flax, Laboratory No. 16010.—Regarding this sample our correspondent at Lethbridge, Alta., writes 'This Golden Flax originated no doubt by accident. I have been growing it for three years, starting with a small handful of seed. Planted this year in the middle of May, it matured 10 days ahead of a field of common flax adjacent. The common flax has a blue flower, this variety has a white flower. It is not as tall but it is a heavier yielder than the common flax. On my field I threshed an average of over 19 bushels to the acre.'

Several years ago 20 samples, representing as many strains, of flax seed grown on the Experimental Farm at Ottawa, were analysed and the following averages were obtained. Protein 24.77 per cent; oil 37.10 per cent. If these figures may be taken as representative of the flax generally grown we may conclude that this Golden Flax, while somewhat low in protein, is very considerably richer in oil than the commercial flax seed on the market.

Bran, Laboratory No. 14661.—This was from the mills of the Maple Leaf Milling Company, Kenora, Ont.

The average composition of bran as obtained from analyses made a few years ago, of samples from the principal milling companies of Canada, is as follows:—

Moisture	11·07
Protein	14·52
Fat	4·37
Carbohydrates	54·19
Fibre	10·14
Ash	5·71
	100·00

This sample, therefore, with 14·84 per cent protein and 3·95 per cent fat, is genuine and of good quality.

Hulless Oats, Laboratory No. 14483.—This sample was from a strain of hulless oats grown on the Experimental Farm, Ottawa. By comparing the data with those from a well-ripened sample of Banner oats, it will be seen that the chief points are a higher protein content and a lower percentage of fibre in the hulless variety.

	Hulless Oats.	Banner Oats.
Moisture	10·84	12·74
Protein	15·89	11·22
Fat	5·00	4·82
Carbohydrates	63·68	58·84
Fibre	2·32	9·47
Ash	2·27	2·91
	100·00	100·00

Molasses, Laboratory No. 14660.—This is a by-product from the refining of cane sugar and imported from Louisiana, U.S.A. Cane molasses differs chiefly from beet root molasses in its lower ash content and in being more palatable.

Further data as to its sugar content were found as follows:—

	Per Cent.
Cane sugar	38.21
Glucose and other directly reducing sugars	22.36
Total sugars	60.57

It is on the percentage of sugar present that molasses may be valued: the other constituents may be considered of insignificant feeding value. Samples of molasses analysed in previous years have shown a total sugar content varying from 45 per cent to 67 per cent. The present sample, therefore, ranks among the best examined in this laboratory.

When molasses, and especially that from the beet root, is fed in large quantities, looseness of the bowels is induced; fed judiciously, as a part of a well-balanced ration, molasses has given excellent results.

Molasses Feed, Laboratory No. 15053.—This was obtained direct from the manufacturers, The Caldwell's Feed Company, Dundas, Ont. Additional data as to sugar content are as follows:—

	Per Cent.
Cane sugar	28.92
Glucose and other reducing sugars	15.94
Total sugars	44.86

Molassine Meal, Laboratory No. 15054.—This was purchased locally (Ottawa), but was manufactured by the Molassine Co., East Greenwich, England.

Supplementing the tabulated data, we obtained:

	Per Cent.
Cane sugar	26.91
Glucose and other reducing sugars	8.41
Total sugars	35.32

Apart from their direct food value, depending practically on their sugar content, these molasses feeds may be considered to act beneficially in increasing the appetite, stimulating the digestion and in keeping the animal in a thrifty condition.

Corn Fodder and Ensilage, Laboratory Nos. 16442-3.—These were used at the Experimental Farm, Brandon, Man., in a steer-feeding experiment, the object being, in a comparative test with the fodder and ensilage, to supply the same amount of dry matter to the animals. On the basis of dry matter one part of the fodder would be equivalent of 2½ parts of ensilage, approximately.

Both are of excellent quality, the protein content of each being somewhat higher than the average for these roughages. It would seem probable from their percentages of fibre that the corn was rather more mature than it usually is in Eastern Canada when cut for the silo.

THE RELATIVE VALUE OF FIELD ROOTS.

The importance of field roots in the ration of nearly all classes of stock is well and widely recognized, even in districts favourable to the successful growth of ensilage corn. Experienced stockmen agree that roots, altogether apart from their high digestibility and palatibility, have a value in maintaining health and thrift in the farm animal, and this medicinal property, if so it may be called, appears to be due in large measure to their potash and soda compounds which are somewhat cooling and slightly purgative in their action. Obviously, therefore, there are several good reasons why

roots should find a place in the ration and why they should be regarded, in judicious quantities, as highly beneficial to the animal.

The absolute feeding value of roots compared with many other classes of feeding stuffs and as reckoned from their percentages of protein and fat must be regarded as low. The percentage of dry matter present is not high—it seldom exceeds 12 per cent—and this is made up chiefly of starch, sugar, pectin and other carbohydrates. The amount of fibre is, as a rule, very low, which no doubt is a factor making for the easy and practically complete digestion of the root.

It is a fairly safe assumption to make that from the nutritive standpoint the relative value of any sample or class of roots will depend chiefly upon the percentages of 'dry matter' and sugar contained—the larger the percentages the greater the value of the root—and it was with this in view that some years ago an investigation was inaugurated in this Division to learn what differences might exist in this regard among the various classes of roots, mangels, carrots, turnips, etc., and among the several varieties, as offered for sale, of each class. This work, carried on from season to season since 1903, has given some very interesting results, in that it has shown wide differences in dry matter and sugar-content between the varieties examined, differences in some cases that amounted to practically 100 per cent. It is the data from a continuation of this investigation on the Central Farm, Ottawa, in 1913, that are presented in the following tables.

MANGELS.

The series comprises thirteen varieties, the larger number of which have been grown and examined in previous years. They are arranged in the order of their richness of dry matter. Data are also given for the percentage of sugar—the most important food constituent in roots—and the average weight per root.

ANALYSIS of Mangels, Central Experimental Farm, Ottawa, Ont., 1913.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	p. c.	p. c.	p. c.	Lb.	Oz.
Mammoth Long Red	87·81	12·19	5·76	2	14
Golden Tankard	88·41	11·59	6·56	2	8
Giant Yellow Intermediate	88·51	11·49	6·89	3	12
Perfection Mammoth Red	88·57	11·43	6·51	2	5
Prize Mammoth Long Red	88·95	11·05	6·76	2	13
Gate Post	89·02	10 98	6·27	3	5
Giant Half Sugar White	89·62	10·38	5 55	3	2
Yellow Leviathan	90·21	9·79	5·07	2	14
Mammoth Yellow Intermediate	90·74	9·26	5·24	2	5
Giant Yellow Globe	91·10	8·90	5·18	2	15
Eckendorfer Red	91·30	8·70	4·44	2	3
Selected Yellow Globe	91·42	8 58	5·07	3	2
Danish Sludstrup	92·39	7 61	3 85	3	3

The results as a whole, compared with those of previous records, show that the mangels of the 1913 crop are quite the equal in dry matter and sugar to those produced at Ottawa in the most favourable seasons. They, however, will bring out the object of this investigation, in making evident that large differences in nutritive value exist among the varieties. Between the richest and the poorest there is a difference of 4.58 per cent dry matter and 1.91 per cent sugar, which means that the former contains 60 per cent more dry matter and 50 per cent more sugar than the latter. Ref-

erence to previous reports on this subject will show that mangels of the following Mammoth Long Red Half Sugar and Giant Yellow Intermediate have been placed at or near the head of the list and are therefrom to be considered as superior in feeding value, and are in consequence, from this point of view, the most desirable to grow.

The character of the season, as well as the richness of the soil, influences the composition and size of root and it will, therefore, be of interest to compare the averages from the results of the past eight years.

MANGELS.—Yield and Average Composition, 1904-1913.

Year.	Number of Varieties Analysed.	Average Weight of One Root.		Yield per Acre.		Dry Matter.	Sugar.
		Lb.	Oz.	Tons	Lb.	p. c.	p. c.
1904	10	2	11	30	1,277	11·69	6·62
1905	17	3	9	39	369	10·04	4·67
1906	16	2	7	31	159	11·63	5·93
1907	10	2	11	27	680	12·64	7·46
1908	12	2	2	23	690	11·87	5·33
1909	14	3	5	28	920	11·21	6·21
1910	8	5	10	56	57	10·04	4·46
1911	23	2	9	29	61	9·51	6·43
1912	13	2	14	.....		10·51	5·63
Average for 9 years	.....	.....		.....		10·96	5·88

INFLUENCE OF HEREDITY IN MANGELS.

It will be evident from what has been said respecting the differences in dry matter and sugar of the several varieties of mangels that heredity may be a factor of some importance in influencing the composition of roots. To obtain more direct evidence on this point we have, for the past fourteen years, grown side by side and analysed the Gate Post and Giant Yellow Globe, varieties representing two distinct types of mangels. The roots were grown, as far as was practicable, under identically the same conditions and consequently any differences in composition exhibited by them might be attributed to transmitted qualities.

The fact that the Gate Post variety has each season for fourteen years without a single exception proved the richer both in dry matter and sugar, affords fairly good evidence that the composition of mangels is influenced by the factor of heredity and, as has been remarked in previous reports, indicates that improvement, as regards nutritive value, might be brought about by well-directed breeding experiments.

DRY MATTER AND SUGAR in Gate Post and Giant Yellow Globe Mangels.

SEASON OF GROWTH.	GATE POST.				GIANT YELLOW GLOBE.			
	Average Weight of One Root.		Dry Matter.	Sugar in Juice.	Average Weight of One Root.		Dry Matter.	Sugar in Juice.
	Lb.	Oz.	Per cent.	Per cent.	Lb.	Oz.	Per cent.	Per cent.
1900	...	...	11·14	6·15	...	...	8·19	2·64
1901	2	9	9·41	4·15	3	3	9·10	4·08
1902	3	2	13·90	9·39	3	9	10·24	5·24
1903	3	3	12·93	7·38	3	13	10·89	6·17
1904	2	14	12·64	7·62	2	13	9·24	5·26
1905	2	13	12·07	6·83	3	12	8·64	3·55
1906	2	2	12·90	6·59	1	8	12·73	6·45
1907	3	10	12·53	7·25	2	7	10·78	6·34
1908	1	11	12·02	4·94	2	4	10·66	4·47
1909	3	14	11·82	6·64	3	7	10·95	5·82
1910	6	8	9·59	4·26	6	13	7 80	2 74
1911	2	11	10·04	3·86	3	1	6·66	1·85
1912	3	5	8·98	5·05	3	2	7·87	4·75
1913	3	5	10·98	6 27	2	15	8·90	5·18
Average for 14 years	...	...	11·49	6 17	...	...	9·47	4·60

TURNIPS.

This series comprises nineteen varieties and the following table gives the results of their examination in the order of their dry matter content.

ANALYSIS of Turnips, Central Experimental Farm, Ottawa, Ont., 1913.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	Per cent.	Per cent.	Per cent.	Lb.	Oz.
Elephant	88·39	11 61	1·44	2	9
Lapland	89·56	10 44	1·73	3	2
Hartley's Bronze Top	89·84	10 16	1 32	2	6
Perfection	89·96	10·04	1·52	2	5
Hazard's Improved	90·14	9·86	1·52	3	8
Kangaroo	90 15	9·85	1·42	3	10
Skirvings	90 19	9·81	1·63	4	0
Canadian Gem	90·24	9·76	1·83	4	1
Hall's Westbury	90·34	9·66	1·53	2	4
Mammoth Clyde	90·35	9·65	1·83	1	15
Good Luck	90·44	9 56	1·42	2	13
Bangholm	90·49	9·51	1·42	2	2
Jumbo	90 50	9·50	1·42	2	9
Halewood's Bronze Top	90 55	9·45	1·62	2	8
Magnum Bonum	90 61	9·39	1·42	3	4
New Century	91·10	8 90	1·52	2	15
Stubb	91·24	8·76	1 83	2	2
Best of All	91·90	8·10	1·42	3	7
Destersundom	91 95	8 05	1·42	3	8

Between the best and the poorest there is a difference of 3·56 per cent dry matter, which means that 2,000 lbs. of the former has a feeding value equivalent to 2,884 lbs. of the latter. These figures are significant and taken into consideration with similar results from previous seasons, give emphasis to the statement that, in the choice of the variety to sow, this question of composition may well be regarded.

The averages for the past eight years are presented in the following table:—

TURNIPS.—Yield and Average Composition, 1905-1913.

Year.	Number of Varieties Analysed.	Average Weight of One Root.		Yield per Acre.		Dry Matter.	Sugar.
		Lb.	Oz.	Tons.	Lb.	Per cent.	Per cent.
1905	20	2	13	30	1,060	10·09	1·10
1906	20	1	10	15	1,890	12·18	1·78
1907	14	3	5	33	142	10·14	1·11
1908	13	3	12	27	1,033	9·87	1·52
1909	13	2	10	29	542	11·30	1·43
1910	10	3	11	31	565	10·87	1·07
1912	19	3	12	33	155	8·65	1·10
1913	19	2	14	24	1,271	9·58	1·54
Average for 8 years						10·33	1·33

As in the case of mangels, the turnips of 1913 are somewhat better than those of 1912, but they have not given an average quite equal to that for the eight years that this experiment has been in progress.

The yearly averages show that considerable fluctuations may occur from season to season as regards dry matter, but that in respect to sugar content the figure remains fairly constant, or at all events that the range lies within narrow limits.

CARROTS.

This series includes six of the best known varieties. The results on the whole are not quite so good as those of last year, though the percentage of sugar was not affected to the same degree as that of the dry matter. Further, the records, show that certain apparent irregularities have occurred, the explanation of which it is not easy to find. Thus the White Belgian, which for several years has been closely associated with the Mammoth White Intermediate at the bottom of the list, is this year the best of all.

ANALYSIS OF CARROTS, Central Experimental Farm, Ottawa, Ont., 1913.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	Per cent.	Per cent.	Per cent.	Lb.	Oz.
White Belgian	89·84	10·16	2·57	1	6
Giant White Vosges	90·35	9·65	2·03	1	14
Ontario Champion	90·79	9·21	2·04	1	3
Half Long Chantenay	90·79	9·21	2·58	1	10
Improved Short White	91·30	8·70	1·70	1	5
Mammoth White Intermediate	92·24	7·76	1·73	1	13

In sugar content, the turnip seldom exceeds 1·5 per cent; carrots as a class are richer in this constituent, though not possessing more dry matter. The sugar in carrots

has throughout the investigation, that is, since 1905, always averaged above 2·0 per cent and in four years of the eight the average has been above 3·0 per cent.

CARROTS.—Yield and Average Composition 1905-1913.

Year.	Number of Varieties Analysed.	Average Weight of One Root.		Yield per Acre.		Dry Matter.	Sugar.
		Lb.	Oz.	Tons.	Lb.	per cent.	per cent.
1905	11	1	3	25	1,510	10·25	2·52
1906	10	1	2	19	1,605	10·59	3·36
1907	6	1	1	24	1,517	10·30	3·02
1908	6	1	3	22	133	10·89	3·34
1909	6	1	0	17	1,680	10·40	2·30
1910	5	1	9	34	1,640	10·17	3·23
1912	6	1	1	18	545	10·50	2·54
1913	6	1	8	24	1,100	9·11	2·11
Average for 8 years						10·27	2·80

There would appear to be less variation from year to year in the composition of carrots than in the case of mangels or turnips, and from this it may be concluded that they are not influenced to the same degree by environmental conditions as the latter roots. It is possible also that the varieties examined are more closely related to one another than the varieties of mangels and turnips. The annual averages, it will be noted, very closely approximate that for the eight-year period.

SUGAR BEETS FOR FACTORY PURPOSES.

The sugar beet, like other farm roots, is susceptible to conditions of season, soil and culture and in order to learn the suitability of different parts of the Dominion for the production of a crop that could be used for the profitable extraction of sugar certain leading varieties have been grown for several years past on the larger number of the Dominion Experimental Farms and Stations. The seed of the three varieties used, Vilmorin's Improved A, Vilmorin's Improved B and Klein Wanzleben was obtained from Messrs. Vilmorin, Andrieux et Cie, Paris, France, the noted breeders of beets with a high percentage of sugar.

The localities at which these beets were grown are widely distributed throughout Canada, from Charlottetown, P.E.I., on the east to Agassiz, B.C., on the west and the results of this investigation therefore, should well indicate the suitability or otherwise of the various provinces for beets of a satisfactory character.

In the following table the beets have been arranged according to variety and the locality where grown from east to west. The data include all the more important determinations necessary for an opinion as to the value of the crop for sugar extraction.

SUGAR BEETS grown on the Dominion Experimental Farms, 1913.

Variety.	Locality.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Coefficient of Purity.	Average weight of One Root.		Yield per Acre.	
					Lb.	Oz.	Tons.	Lb.
Vilmorin's Improved A	Charlottetown, P.E.I.	14·45	16·11	89·6	2	9	14	1,436
	Kentville, N.S.	17·91	18·37	97·5	0	11	14	512
	Nappan, N.S.	19·79	20·90	94·7	1	2	16	500
	Cap Rouge, Que.	19·55	22·37	87·4	0	13	0	592
	Ottawa, Ont.	15·64	17·46	89·5	0	15	14	850
	Brandon, Man.	13·65	16·27	83·9	2	1	14	1,700
	Rosthern, Sask.	15·80	18·46	85·5	1	14	16	1,060
	Indian Head, Sask.	20·42	21·97	92·9	1	6	14	1,760
	Lethbridge, Alta., (irrigated).	19·47	21·26	91·6	1	10	15	674
	" (non-irrigated)	19·85	21·46	92·5	1	1	9	743
	Lacombe, Alta.	13·45	15·51	86·7	1	4	2	1,550
	Agassiz, B.C.	12·64	15·06	83·9	1	4	23	1,100
Vilmorins Improved B.	Charlottetown, P.E.I.	15·90	17·66	90·0	2	10	15	1,152
	Kentville, N.S.	16·61	17·11	97 0	0	14	12	1,872
	Nappan, N.S.	19·27	20·82	92·6	0	14	14	1,000
	Cap Rouge, Que.	20·22	23·60	85·7	1	1	0	855
	Ottawa, Ont.	16·34	17·66	92·5	1	0	15	1,750
	Brandon, Man.	14·17	17·63	80·4	1	10	16	1,220
	Rosthern, Sask.	14·94	17·86	83·7	2	5	12	1,010
	Indian Head, Sask.	20 75	21 57	96·2	1	4	12	1,200
	Lethbridge, Alta., (irrigated).	19·54	20 66	94·5	1	8	14	861
	" (non-irrigated)	19·93	21·66	92·9	0	13	12	499
	Lacombe, Alta.	12·59	14·26	88·2	1	1	2	800
	Agassiz, B.C.	19 96	21 63	92·3	1	7	24	1,250
Klein Wanzleben.	Charlottetown, P.E.I.	16·55	17·46	94·8	2	11	15	1,020
	Kentville, N.S.	16 98	17·31	98·1	0	13	11	176
	Nappan, N.S.	18·44	19 42	94·9	0	13	10	1,000
	Cap Rouge, Que.	20 04	22 30	89·9	0	15	0	435
	Ottawa, Ont.	17·47	18 46	94 6	1	3	15	1,250
	Brandon, Man.	13 93	17·03	81·7	2	4	19	1,160
	Rosthern, Sask.	16·08	18 46	87 1	2	2	12	348
	Indian Head, Sask.	21·01	22·10	95·0	1	3	12	1,200
	Lethbridge, Alta., (irrigated)	19 60	22·26	88·0	1	12	13	166
	" (non-irrigated)	18 82	21 46	87·7	1	4	10	1,144
	Lacombe, Alta.	11·97	13 66	87·6	1	6	2	850
	Agassiz, B.C.	21 65	22·63	95·6	1	6	24	
Raymond No. 2358	Lethbridge, Alta., (irrigated)	17 83	20 26	88·0	1	9	12	1,735
"	" (non-irrigated)	19 09	20·66	92·4	1	8	12	1,505

Very considerable fluctuations will be observed as to richness in sugar in the same variety, due to conditions of season, etc., as obtaining at the several points of growth. These conditions, as taken from the field notes of the several Superintendents, may be briefly given and will be found of interest when making a study of the analytical data:

Charlottetown, P.E.I.—The soil is a friable, sandy loam, in good condition. The season was favourable to a heavy yield, but the actual sunshine as recorded was, during the ripening period, much below the average for a number of years past.

The results indicate a crop of fair quality only, due in part probably to lack of sunshine when ripening and in part to the large size of the roots. The average percentage of sugar in juice for the three varieties is very close to that of 1912, but decidedly lower than that obtained in 1911.

Kentville, N.S.—The soil is a sandy loam of rather poor quality. The season was fair for root crops in general, and an average yield was obtained.

Both as to sugar content and purity the beets from this Station are of excellent quality, indicating a crop eminently suitable for factory purposes.

Nappan, N.S.—A clay loam of good quality. The first part of the season was cold and backward, continuing cool until the middle of June, when weather became more promising. There was an unusual rainfall both in the earlier and later part of season, but the crop made a satisfactory growth.

The sugar percentages of all three varieties are excellent, and in this respect similar to those of previous seasons at this point. Since 1902, the first record for sugar beets at this farm, the annual average, almost without exception, has been high.

Cap Rouge, Que.—As a crop, the sugar beets were, for the third season in succession, a failure. This was probably in a large measure due to poor germination of the seed, owing to lack of moisture in the soil. The yields, it will be noticed, are exceedingly low. It has been found, in an examination of the soil recently made in the Farm laboratories, that the land is deficient in lime and slightly sour. An experiment will be carried on this year, applying lime, to learn how far the failure of this crop has been due to lime deficiency. The soil is described as a sandy loam with a shaly subsoil at 15 to 25 inches.

The sugar content of such beets as were obtained, was quite satisfactory, indeed decidedly above the average, indicating that, in spite of untoward conditions for a good yield, the conditions were favourable for a rich beet. The spring opened early and the temperatures almost ideal until August, when dry weather, which checked the growth of the roots, set in and continued until September 22nd.

Ottawa, Ont.—The soil is a sandy loam in fairly good condition. The yield was an average one and the beets of excellent quality, both as regards sugar content and purity.

Brandon, Man.—The soil is a rich, black, clay loam, characterized by a large humus and nitrogen content. The season as a whole was dry. The results as regards sugar percentages are only fair, with a rather low co-efficient of purity. Occasionally, beets with a satisfactory sugar content are obtained at this Farm, but as a rule the data do not indicate high quality, either as regards sugar or purity.

Rosthern, Sask.—The soil is a loam, rather light and rich in organic matter; it is slightly affected with alkali. The growth was not satisfactory and the yield was light. The season though not ideal for roots was not, on the whole, unfavourable. As in 1911 and 1912, however, analytical data do not indicate a very rich or a very pure beet.

Indian Head, Sask.—The soil is a rich clay loam. There was an ample precipitation during the growing season, especially June, July and August. The results are decidedly better than those of last year, or indeed of any previous season at this Farm. The average percentage of sugar in juice for the three varieties is 20·73 and is the highest average obtained this year, though at four other points an average of over 19 per cent is recorded.

Lethbridge, Alta.—A sandy to clay loam. During the latter part of May and early part of June the weather was very dry. Beginning the latter part of June and all through July and the greater part of August, there was a reasonable amount of rain but not enough to bring the yield of the beets on the dry land to equal that from the irrigated area. The weather during the month of September was generally dry and windy, and should have been favourable to the proper ripening of the beets.

The percentages of sugar as found in the irrigated and non-irrigated beets are remarkably close, and this is true for all three varieties. All the beets are of excellent quality, the averages for sugar in juice exceeding 19 per cent, and the co-efficient of purity of two of the varieties exceeding 90. In that the analytical

data do not show any marked differences in quality between the crops grown on irrigated and non-irrigated land, the results are similar to those of 1912. In very dry seasons we have found the non-irrigated beets somewhat the richer.

The yields on the irrigated land, as usual, were larger than those from the non-irrigated area, the differences for the past season being more marked than for several years.

Seed supplied by the sugar factory at Raymond, Alta., was also sown on irrigated and non-irrigated land. While the data for sugar and purity from both areas were highly satisfactory, the beets grown on the non-irrigated were somewhat the richer.

Lacombe, Alta.—The results have been unsatisfactory at this farm, both as to quality and yield, ever since the beginning of the inquiry in 1907, presumably due chiefly to unfavourable weather conditions. This season they are the lowest in the series. The soil is a heavy, black clay loam well supplied with plant food.

A study of the following meteorological observations at Lacombe will reveal, we think, the reasons for the lack of growth and the conclusion that the roots did not properly mature.

Meteorological Observations for Lacombe, Alta., Season of 1913.

Month.	Maximum	Date.	Minimum.	Date.	Mean temperature.	Precipitation.	Sunshine.
April	77·8	12th	17·4	23rd	42·2	·15	260·8
May	77·4	25th and 30th	18·1	5th	46·81	·48	277·1
June	81·8	9th	36·2	17th	56·97	2·98	271 9
July	84·8	24th	31·9	25th	57·65	3·43	336 3
August	84 0	26th	35·5	19th	57·6	2·435	311·1
September	80 0	8th and 27th	24·4	23rd	50·9	·59	240·4

The beets were sown on May 26, and pulled September 23.

Agassiz, B.C.—In both yield and quality two of the varieties gave excellent returns; the third, for some reason not apparent, was much below the average in sugar content.

The soil is a sandy loam and the season, as in 1912, was somewhat cool and wet.

In the following table we present the averages as regards sugar content in juice for the period 1902-1913, obtained at the several localities included in this investigation.

Average Percentage of Sugar in Juice in Sugar Beets grown on the Dominion Experimental Farms, 1902-1913.

Locality.	1902.	1903	1904.	1905.	1906.	1907.	1908	1909.	1910.	1911.	1912.	1913.
Charlottetown, P.E.I.									14·25	17·23	15·31	15·63
Kentville, N.S.												17·17
Nappan, N.S.	15·87	15·33	14·41	16·52	17.08		17·53	16·74	16·43	17·56	16 68	19·17
Cap Rouge, Que.										16 16	14·92	19·94
Ottawa, Ont.	16·77	15 34	16·91	12·45	14 37	15·44	16·30	14·84	16·44		17·59	16·48
Brandon, Man.		11·36	16·62	11·09	15 50	16 99	15·82	18·83	18·40	13·50	13·40	13·92
Indian Head, Sask.	15·15	16·54	15·24	14·94	14.91	15 92	15·66	17·16		14 18	15 78	20·73
Rosthern, Sask.										13·30	14·93	15 61
Lethbridge, Alta., Irrigated							16·09	17·91		17·02	17·41	19 54
" Non-irrigated							16·73	18·36		14·05	17·68	19·33
Lacombe, Alta.						13·34	11·21	12·77	12·69			12·67
Agassiz, B.C.		17·44	8·10	17·32	14.28	17·65	17·15	18·30	19·18	16·95	17·53	18·08

When it is remembered that it is seed of the same stock that is sown throughout the series, the results will be of interest in showing the degree to which the quality of the beet may be modified by weather and cultural conditions. From the same seed, beets were grown which yielded averages differing as much as 6·8 per cent sugar.

It will be further apparent from these data that beets of excellent quality for sugar extraction may be grown in many widely distant portions of the Dominion.

INSECTICIDES AND FUNGICIDES.

Arsenate of Lead.

The reader is referred to the annual report of this Division for 1912 for a general discussion of this insecticide, its composition, nature and use. It may, therefore, be only necessary here to insert its more salient properties and enumerate the essential features which will enable the orchardist to judge of the relative merits of the various brands upon the market.

This insecticide, it may be recorded, is steadily growing in popularity with fruit-growers and for the spraying of shade and forest trees. In many districts, it has completely supplanted Paris green, the poison that was, until a few years ago, almost universally employed against 'biting' insects. The reasons for this are, chiefly, the greater adhesiveness of the arsenate of lead to the foliage—thus lengthening the period of efficiency of the spray—that it is practically non-injurious to foliage, even in comparatively strong sprays and that the fine state of division in which this compound exists prevents it from readily settling out of the spray, thus contributing towards a uniform application of the poison on the foliage.

The larger number of well known brands of the arsenate of lead paste—the form in which it finds most favour with orchardists—contain in the neighbourhood of 50 per cent water, and less than .5 per cent of soluble arsenic oxide—the constituent that burns the foliage. Some few years ago, this Division proposed, tentatively, a standard as follows:—

'That any arsenate of lead paste to be accounted genuine shall contain at least 50 per cent arsenate of lead; that the arsenic oxide in such combination shall not be less than 12.5 per cent; that the water soluble forms of arsenic should not exceed one per cent calculated as arsenic oxide, and that there should be no admixture with foreign materials to reduce or affect its strength.'

Arsenate of lead is also sold as a dry powder, but its use in this form, either as a 'dust' spray or in the making of a liquid spray, has not found general favour.

During the past year, thirteen samples have been analysed and the data are presented in the following table. These brands, representing those found on the Canadian market and one or two specially imported for experimental purposes, were submitted by the Horticultural Division, which, during the past two seasons, has been carrying on an extensive investigation in the Farm's orchards and fruit plantations with this insecticide. The samples for analysis were taken from the original containers.

Analysis of Arsenate of Lead, 1913-14.

Labv. No.	Brand and Manufacturer.	Water.	Total Arsenic Oxide As_2O_5	Total Lead Oxide PbO.	Soluble Impurities other than As_2O_5 and PbO.	Insoluble Impurities (by difference.)	Total.	Soluble Arsenic Oxide	Soluble Lead Oxide.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
13820	"Berger's Lead Arsenate" Lewis Bergers & Sons, Ltd., Homerton, London, N. E., England.	49·03	10·88	37·73	·51	1·54	100·00	·17	·14
17053	Bowker's Lead Arsenate, Bowker Insecticide Co., Baltimore.	38·23	19·88	38·67	1·88	1·24	100·00	·15	Traces.
17054	"Grasselli's," The Grasselli Chemical Co., Cleveland, Ohio.	40·00	16·44	41·47	1·46	·63	100·00	·46	"
17055	"Swifts," Merrimac Chemical Co., Boston, Mass.	51·45	15·10	30·00	1·13	2·32	100·00	·37	Nil
17056	"Dry," Canadian Paint Co., Toronto	·50	32·18	60·77	4·23	2·32	100·00	·77	Traces.
17058	"Dry," Sherwin-Williams Co.	·42	31·31	62·43	4·11	1·73	100·00	·89	"
17059	"Neutral," Canada Paint Co., Toronto	48·41	14·35	34·96	1·01	1·27	100·00	·59	"
17060	"Dry," Thomson Chemical Co.	·23	30·76	63·48	1·49	4·04	100·00	·51	"
17061	"Electro," Vreeland Chemical Co., N. Y.	46·48	17·15	33·65	·80	1·92	100·00	·27	"
17063	"Dry," Vreeland Chemical Co., N. Y.	·20	31·62	61·80	1·42	4·94	100·00	·18	"
17064	"Triplumbic," Thomson Chemical Co., Baltimore	46·66	12·25	37·64	·15	3·29	100·00	·53	"
17065	"Standard," Thomson Chemical Co.	48·08	18·59	31·25	2·17	·31	100·00	·53	"
17066	New process, Sherwin-Williams Paint Co., Toronto	45·94	15·21	36·34	·92	1·59	100·00	·48	Nil

Detailed comment on these data is unnecessary, but it may be pointed out that those pastes containing the least water and the smallest percentages of soluble arsenic oxide are, other things being equal, of the best quality.

We may be permitted to repeat that the practice followed by some manufacturers of putting a guarantee on the label, stating the percentage of arsenate of lead and particulars as to soluble impurities, is to be commended. It would allow the purchaser to judge of the relative merits of the various brands offered on the market.

Formaldehyde.

From time to time, samples of formaldehyde are sent in by farmers and agricultural organizations in the northwest, for examination. Occasionally we have found a sample below standard strength but these, as a rule, have been taken at retail stores, from bulk; those drawn from the original containers have almost invariably conformed to the guarantee. We have no evidence, therefore, that the manufacturers are putting out a product below the standard though, as might be expected, all brands are not identical in the percentage of formaldehyde they contain.

Laboratory No.	Formaldehyde by weight. Per Cent.
14030 contains	37·17
14286 "	38·21
14287 "	37·51

It is evident from these data that there had been no adulteration, the standard strength calling for 40 per cent by volume which is, approximately, 37.3 per cent by weight. They all conform with the guarantee.

The turbidity or milkiness observed in some samples is due to a slight 'polymerization' or the conversion of a part of the formaldehyde into a solid form. We have no data that would allow us to make any definite or final statement regarding the effect of slight polymerization on the value of the solution for destruction of smut in grain but such experience as we have had has not shown that there is any marked falling-off in fungicidal value.

Pine Spray Insecticide.

Laboratory No. 15042, submitted by the Horticultural Division and forwarded for trial by Robinson Bros., Ltd., W. Bromwich, Staffs, England. It had the appearance of a strong soap solution and possessed a markedly alkaline reaction.

Analysis.

	Per Cent.
Moisture and loss at 100 degrees C	70.4
Total oil or fat	25.7
Total alkali, all potash	2.45
By distillation—	
Water	62.0
Light oils	8.

This is evidently an aqueous solution of a potash soap containing a certain percentage of light oils.

It may be noted that emulsions and sprays made with a potash soap possess better spraying qualtities than those made with a soda soap.

Worm Killer.

Laboratory No. 15043.—Submitted by Horticultural Division and also forwarded by Robinson Bros., Ltd. It is a clear, magenta colored liquid, with a slight deposit.

Analysis.

Total solids at 100 degrees C., 26·58 grams per 100 c.c. containing
Mercuric chloride, 26·18 grams per 100 c.c.

This is a solution of mercuric chloride (corrosive sublimate), in an acid solution, the normality of which is .93. The colouring matter is evidently added as a precautionary measure, corrosive sublimate being an active and virulent poison to man and beast.

VELVAS LAWN SANDWEED KILLER AND FERTILIZER.

Laboratory No. 15045.—Submitted by Horticultural Division; forwarded for trial by Robinson Bros., Ltd. It is in the form of a powder, of grayish-white appearance.

Analysis.

	Per Cent.
Sulphate of iron	11.40
Sulphate of ammonia[1]	26.60
Mineral matter insoluble in acid, sand, etc.	60.30
[1] Equivalent to nitrogen	5.6

Free from arsenic.

This is a mixture of sulphate of iron and sulphate of ammonia with about 60 per cent of sand. Sulphate of iron is used for the destruction of dandelions in lawns, but with somewhat doubtful success. Sulphate of ammonia is valuable as a fertilizer for supplying available nitrogen.

TOBACCO DECOCTION.

Laboratory No. 16866.—Submitted by the Division of Entomology, as a decoction made in the course of experimental work for the destruction of aphides. The decoction was made by boiling one pound of tobacco 'stem butts' in two gallons of water, allowing the preparation to simmer for one hour. Water from time to time was added to replace that lost by evaporation. It was of the colour of fairly strong tea.

Analysis.

Nicotine ..... ·45 per cent.

The following report was written on this sample: 'We can find but little evidence in such literature as we have access to, as to the "strength" of the tobacco decoction necessary to be effective in the destruction of aphides, that is, interpreting strength as percentage of nicotine present. It has always seemed probable that the insecticidal value of the decoction might depend in some measure on other compounds present—tannin, bitter principles, etc. The nicotine present in tobacco stems is stated to be about 0·5 per cent and the directions for making the decoction usually call for 1 to 2 lbs. to 2 gallons (20 lbs.) of water, the water while still boiling being poured over the stems and the mass allowed to steep overnight. Whether this extracts all the nicotine we have no evidence.

'The Kentucky Experiment Station reports on a tobacco extract prepared in St. Louis, U.S.A, (evidently by concentration) that contains 3·0 per cent nicotine, stating that the experiments showed that this extract diluted in the proportion of 1 part to 70 parts of water, was effective as a spray for aphides. If we assume that the nicotine present measures the insecticidal value of the spray, then the decoction under discussion would bear considerable dilution, say 1 part to 10 parts water. There is, however, considerable doubt as to such diluted decoction being effective. Careful experimental work is evidently needed, with the analysis of such sprays as may be found effective.'

THE FERTILIZING VALUE OF RAIN AND SNOW.

The data for the seventh year of this investigation, the chief object of which is to determine the possible enrichment of the soil, per acre, from the nitrogen compounds furnished by the precipitation, are here recorded. It will not be necessary to discuss in any detail the plan of the work, nor the factors that have been found to influence the nitrogen-content of the rain and snow, as these matters were more or less fully dealt with in our report for 1913, to which the interested reader may be referred for further particulars of this research and its relation to practical agriculture.

The seventh year closed February 28th, 1914, and during the preceding twelve months 84 samples were analysed, 61 of rain and 23 of snow, representing a total precipitation of 31.78 inches.

In table I the data are given for the monthly totals of precipitation, the monthly average nitrogen-content of the precipitation present as free and albuminoid ammonia and as nitrates and nitrites and for the pounds of nitrogen so furnished, per acre.

The total precipitation 31.78 inches, is 8.18 inches less than that of the previous year and, as we shall see from a subsequent table, 2.56 inches less than the average at Ottawa for the past 23 years. In both rain and snow the amounts are below the averages, though the reduction is chiefly in the snowfall.

Ottawa as a rule is favoured with a fairly equable precipitation throughout the year and the records for the year ending February 28, 1914, show but one summer month, June—and one winter month—February—when the precipitation fell below 2 inches. June was exceptionally dry, with less than an inch of rain. March and October were the only months in which the precipitation exceeded 4 inches.

TABLE I.—Rain and Snow at Ottawa for the Year ending February 28, 1914.

MONTH AND YEAR.	PRECIPITATION IN INCHES.			NITROGEN.				Pounds of Nitrogen per acre.
	Rain.	Snow.	Total in Inches of Rain.	In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates & Nitrites.	Total.	
1913.				p.p.m.	p.p.m.	p.p.m.	p.p.m.	
March	2·20	24 25	4·62	·17	·12	·16	·45	·471
April	2·00	.....	2·00	·63	·17	·34	1·14	·517
May	2·39	.....	2·39	·40	·09	·19	·68	·368
June	·82	.....	·82	·60	·13	·65	1·38	·256
July	2·30	.....	2·30	·37	·12	·41	·90	·469
August	3·13	.....	3·13	·93	·16	·49	1·58	1·121
September	2·69	.....	2·69	·68	·07	·23	·98	·597
October	4·08	.....	4·08	·54	·19	·20	·93	·860
November	2·48	2·60	2·68	·82	·04	·02	·88	·535
December	·58	17·00	2·28	·58	·08	·15	81	·419
1914.								
January	·64	30·50	3·69	·26	·08	·17	·51	·426
February	.....	11 00	1·10	·32	·14	·21	·68	·169
Total	23·31	84 75	31·78	.....	.....	.....	.....	6·208

The total nitrogen for the year amounted to 6.208 pounds, per acre—an amount practically identical with the results obtained for the two preceding years. A comparison of the annual precipitation and amount of nitrogen furnished per acre for the

past seven years is allowed by the data set forth in table II, and it is interesting to note how very close the figures for the last mentioned datum are to the average for the whole period of seven years during which this examination has been carried on.

TABLE II.—Precipitation and Amount of Nitrogen per Acre, Ottawa, Ont., 1908-1914.

	Rain in inches.	Snow in inches.	Total precipitation in inches.	Pounds of nitrogen per acre.
Year ending February 29, 1908	24·05	133·00	37·35	4·322
" " 28, 1909	22·99	96·25	32·63	8·364
" " 28, 1910	28·79	80·75	36·87	6·869
" " 28, 1911	19·67	73·00	26·97	5·271
" " 29, 1912	20·33	104·25	30·76	6·100
" " 28, 1913	30·34	96·25	39·96	6·144
" " 28, 1914	23·31	84·75	31·78	6·208
Average for 23 years	25·14	92·03	34·34	6·182
" 7 "				

In table III the weights and proportions of the total nitrogen furnished by the rain and snow respectively are presented for the year and for the experimental period 1908-1914. Of the total amount of nitrogen per acre, for the past year, 6·208 pounds, the data indicate that 5.192 pounds or 84 per cent of the whole was furnished by the rain, and 1.016 pounds, or 16 per cent, by the snow. It will be observed that for the past 5 years the proportions so supplied are remarkably constant, leading to the conclusion that for the precipitation at Ottawa practically 85 per cent of the total nitrogen is found in the rain.

TABLE III.—Amounts of Nitrogen furnished by Rain and Snow.

	Total.	By Rain.		By Snow.	
		Pounds.	Proportion.	Pounds.	Proportion.
	Lbs.		Per cent.		Per cent.
Year ending February 29, 1908	4·322	3·243	75	1·080	25*
" " 28, 1909	8·364	7·528	90†	·836	10
" " 28, 1910	6·869	5·830	85	1·040	15
" " 28, 1911	5·271	4·424	84	·847	16
" " 29, 1912	6·100	5·075	83	1·025	17
" " 28, 1913	6·144	5·113	83	1·031	17
" " 28, 1914	6·208	5·192	84	1·016	16

* Snowfall exceptionally heavy.
† Rain abnormally rich in ammonia due to bush fires.

The data of table IV are of interest in showing the distribution or proportion of the various nitrogen compounds in the rain and snow. Of the total nitrogen, 6.208 pounds, there are 4.471 pounds, or 72 per cent of the whole present as free and organic ammonia and 1·737 pounds, or 28 per cent as nitrates and nitrites. These ratios are identical with those of last year and in close accord with those obtained throughout the period of investigation.

The greater richness of the rain in nitrogen compounds is also brought out by the tabulated figures.

TABLE IV.—AVERAGE Nitrogen-content of Rain and Snow.

(Amount of Nitrogen per acre as Free and Albuminoid Ammonia and as Nitrates and Nitrites, 1913-1914.)

	Number of Samples Analysed.	Precipitation in Inches.	Nitrogen.								
			Parts per Million.				Percentage of Total.			Pounds per Acre.	
			In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	Total.	In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	As Free and Albuminoid Ammonia.	As Nitrates and Nitrites.
Rain....	61	23.31	.327	.145	.328	1.212	61	12	27	3 790	1.402
Snow ...	23	84.75	.265	.050	.174	.529	50	17	33	.681	.335

Although the amount of nitrogen furnished by the rain and snow is not very large when considering the up-keep of the soil in this element—in the neighbourhood of 6 pounds, per acre, per annum—it is worthy of note that this nitrogen presents itself in forms immediately and directly available for crop use and that the larger amount falls at a season when vegetation is active. It is therefore, a warrantable assumption that the rain, apart from its solvent action in the soil and its many physiological functions, plays an important role in directly assisting the growth of crops by supplying them with a part of their needed nitrogen.

THE WATER SUPPLY OF FARM HOMESTEADS.

Since the establishment of the Dominion Experimental Farms the question of the water supplies of farm homesteads, creameries and cheese factories, and, to a more limited degree, those of rural schools, has received the attention of the Division of Chemistry. Through the various means taken we are aware that an interest has been awakened in the rural water supply, and much good accomplished, but we also feel convinced that there is a necessity to continue the campaign for better water. The evidence at hand supports us in this view, for of the waters sent in for examination a very large proportion, even in these later years of our propaganda, must be adjudged as impure, chiefly through the presence of excretal drainage matter. We have reason to believe that farmers as a class are not yet fully alive to the importance of a pure water supply, for the health of themselves and their families, for the thrift of their stock and for the quality and wholesomeness of their dairy produce.

The source of the supply on the larger number of farms is the shallow well, say from 5 to 30 feet deep, which merely collects 'ground water,' the soakage from the surrounding soil. Unless the location is beyond reproach from the sanitary standpoint, this shallow well is a menace—its waters may at any time become a source of danger. When, as is only too frequently the case, we find these wells sunk in the barnyard, or under the barn or stable, or not far from the privy (a most crude and unsanitary affair, as a rule), or near the back door, out of which the household slops may be thrown and near which the garbage heap with all sorts of refuse may be found, then contamination of the water is inevitable and unavoidable. It is quite true that most soils, and more particularly those which are porous and well aerated (gravels and sands), possess filtering and purifying properties,, but the soil surround-

ing the wells located as we have described, must in time become saturated with organic filth of a most objectionable character. Such soil is then no longer able to purify the water passing through it, but rather serves to contaminate it more seriously.

We strongly advocate the bored or drilled well, tapping a deep-seated source. It cannot be stated that such a well will necessarily yield a good drinking water, but nevertheless it is the source of supply to be generally recommended for the isolated household. If there are no fissures in the overlying strata and there is no opportunity for water to flow downwards between the piping and the sides of the boring, a good water will in all probability be obtained.

To those, who for one reason or another, must rely on the shallow well, we would say that the area around the well, say for a radius of at least 50 yards, be kept free from manure and all filth. It may preferably be kept in sod. Another precaution of considerable value towards the protection of the well water from organic filth, is to line the well to a depth of say 10 to 12 feet and to a thickness of say 6 inches with concrete or puddled clay. This lining should project some 6 to 12 inches above the mouth of the well. This will prevent the direct inflow of wash and of water from the surface soil and will in all probability ensure a certain amount of filtration through clean layers of soil.

During the year 168 samples were submitted to analysis. The analytical data and a summarized report as to quality are given in the appended table. Sixty-two were pronounced as pure and wholesome, forty-four as suspicious and probably dangerous and twenty-five as very seriously contaminated. Thirty-four samples were too saline for potable use.

Farmers desiring an examination of their water supply are invited to send for a copy of the directions to be followed in the collection and shipment of the sample. Samples are constantly being received at the laboratories which, owing to insufficiency in quantity, dirty containers or corks, or through other causes cannot be submitted to analysis; trouble and expense to the farmer will, therefore, be saved if these instructions are first obtained and faithfully carried out.

Analyses of Well Waters, 1913–14.—Results stated in Parts per Million.

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
1	Ottawa, Ont.	A.C.	April 1	·02	·04	1·22	3·5	273·6	197·2	76·4	Free	Contaminated.
2	"	"	" 1	·02	·02	1·22	3·5	276·0	200·0	76·0	"	"
3	Maxville, Ont.	Dr. Mc.	" 3	·68	·08	·066	·5	283·2	226·4	56·8	Faint.	Suspicious.
4	"	J.A.	" 3	·07	·16	Free.	10·0	352·8	255·2	97·6	Heavy	Polluted.
5	Ottawa, Ont.	C.E.F	" 3	·01	·06	·75	8·0	335·2	208·8	126·4	Free.	Wholesome.
6	Sault Ste. Marie, Ont.	A.P.E	" 3	.....	.....	.....	.....	378·4	316·8	61·6	"	Free from pollution.
7	Ottawa, Ont.	H.H.C.	" 4	·02	·10	2·62	17·0	393·6	274·6	119·0	F. trace	Suspicious.
8	Coquitlam, B.C.	No. 98	" 10	·05	·04	·058	Free.	22·0	12·0	10·0	Free.	Wholesome.
9	"	No. 99	" 10	·04	·06	·058	"	20·0	8·6	11·4	"	"
10	Maymount, Sask.	L.C.C	" 14	.....	.....	.....	25·0	1316·0	900·0	416·0	.....	Saline.
11	Ottawa, Ont.	J.O.	" 15	·16	·04	Free.	6·5	288·0	245·2	42·8	F. trace	Suspicious.
12	Portsmouth, Ont.	W.E.B	" 16	·63	·06	2·35	1750·0	3702·4	2693·6	1008·8	"	"
13	Tracy Station, N.B.	E.B	" 19	·01	·06	·09	330·0	712·0	687·2	24·8	Free.	Wholesome.
14	McKinnon, Man	T.E.	" 24	·04	·14	16·50	130·0	1402·0	891·2	510·8	F. trace	Suspicious.
15	"	T.E	" 24	3·32	·28	Free.	180·0	930·8	802·8	128·0	Trace.	"
16	Kentville, N.S	W.S.	" 28	·08	·09	3·43	55·0	231·2	172·8	58·4	F. trace	"
17	Gatineau Point, Que.	C.P	" 29	·04	·09	2·05	5·5	282·8	204·0	78·8	Trace.	"
18	Beauce, Que.	E.W.B.	" 29	·84	·04	Free.	17·0	356·8	258·0	98·8	"	Seriously polluted.
19	Ottawa, Ont.	A.G	" 29	Free.	·20	1·82	17·0	290·0	185·6	104·4	"	Suspicious.
20	Deseronto, Ont.	C.A.M.	May 2	"	·04	1·49	17·0	322·8	200·0	122·8	F. trace	Polluted.
21	Linden Terrace, Ont.	W.D.H.	" 5	·66	·04	Free.	870·0	1936·0	1868·0	68·0	Trace.	Suspicious.
22	Bradwell, Sask.	E.W.	" 5	3·10	·73	"	310·0	7635·0	6240·0	1395·0	Free	Saline.
23	Coquitlam, B.C.	No. 100.	" 7	Trace.	·13	·099	·5	16·8	4·6	12·2	"	Wholesome.
24	"	No. 101.	" 7	·04	·06	Free.	·5	13·4	6·2	7·2	"	"
25	"	No. 102.	" 7	Trace.	·04	·016	Free.	12·8	3·8	9·0	"	"
26	"	No. 103.	" 7	Trace.	·02	Free.	"	14·6	6·0	8·6	"	"
27	Cochrane, Alta.	C.W.F.	" 8	.....	.....	.....	.....	420·0	305·0	115·0	.....	Unpolluted.
28	Calgary, Alta.	R. McB.	" 9	Trace.	·27	Free.	·50	470·0	280·0	190·0	Free.	"
29	Nipisiquit River, N.B.	E.P.	" 10	·10	·12	Free.	Free.	32·0	10·4	21·6	"	Free from contamination.
30	Ottawa, Ont.	R.B.	" 15	·02	·12	3·96	11·5	408·0	325·2	82·8	Trace.	Contaminated.
31	"	H.S.I.	" 15	1·64	·06	·63	10·0	206·4	165·2	49·2	"	Suspicious.
32	Winchester, Ont.	H.S.	" 15	Trace.	·12	1·02	54·0	773·6	592·0	181·6	Free.	"
33	Ottawa, Ont.	J. McC.	" 16	·34	·06	Free.	13·0	220·0	138·0	82·0	Trace.	Free from organic pollution.
34	Mezpah, Alta.	D. McC.	" 16	·92	2·76	"	120·0	12410·8	7618·8	4792·0	Free.	Non-potable.
35	Clarence, Ont.	J.G.	" 16	17·44	·28	"	6250·0	10370·8	9126·8	1244·0	Trace.	"
36	"	J.G.	" 16	17·28	·28	"	6250·0	10272·0	9052·0	1220·0	"	"
37	Sault Ste. Marie, Ont.	D.N.S.	" 22	·20	.56	·86	35·0	168·0	103·0	65·0	.....	Contaminated.

RESULTS OF WELL WATERS, 1913-14—Results Stated in Parts per Million—*Continued.*

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 100° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
38	Selma, Sask.	H.J.J.	" 28				Trace.	1064·0				Free from pollution.
39	Navan, Ont.	J.M.	" 28				Trace.	290·0				" "
40	Carp, Ont.	A.H.	" 30	Free.	·14	9·90	64·0	669·2	508·0	161·2	Free.	Polluted.
41	Ewart, Man.	J.S.	" 31	·8·66	·08	Free.	3500·0	6676·0	5480·0	1196·0	"	Saline.
42	Dunrobin, Ont.	H.S.K.	June 4	Free.	·88	1·45	17·5	240·0	114·0	126·0	"	Contaminated.
43	Ottawa, Ont.	A.G.	" 9	·02	·19	2·64	13·5	268·0	152·0	116·0	Trace.	Suspicious.
44	Coquitlam, B.C.	No. 104.	" 11	·04	·12	Free.	·7	9·0	7·2	1·8	Free.	Wholesome.
45	"	No. 105.	" 11	·04	·065	"	·5	15·4	3·4	12·0	"	"
46	"	No. 106.	" 11	·04	·05	"	·5	13·0	4·8	8·2	"	"
47	"	No. 107.	" 11	Trace.	·025	·033	·5	14·0	6·0	8·0	"	"
48	Ottawa, Ont.	R.C.	" 12	·17	·06	·69	7·5	371·2	294·0	77·2	"	Gravely suspicious.
49	Dirleton, Ont.	J. McL.	" 17	Free.	·04	Free.	5·5	326·0	186·0	140·0	"	Wholesome.
50	Oak Bank, Man.	C.E.D.	" 19				100·0					Saline.
51	Ottawa, Ont.	D.A.B.	" 21	Free.	·10	8·30	23·5	436·0	242·8	193·2	F. trace	Suspicious.
52	Deseronto, Ont.	C.A.M.	" 23	"	·033	2·64	18·0	314·0	264·0	50·0	Free.	"
53	Upper Keswick, N.B.	O.E.M.	" 23	"	·02	·53	Free.	116·0	83·2	32·8	Trace.	Free from pollution.
54	"	O.E.M.	" 23	Trace.	·0125	Trace.	1·5	34·0	20·0	14·0	Free.	" "
55	Pettapiece, Man.	F.W.B.	" 23	2·80	·18	Free.	215·0	3030·0	2522·0	508·0		Saline.
56	Ottawa, Ont.	C.E.F.	" 27	·012	·029	·93	8·5	367·2	276·0	91·2	Free.	Wholesome.
57	Forget, Sask.	J.L.	" 28				F. trace.	770·0	580·0	190·0		
58	Durham Centre, N.B.	McM. Co.	" 28	Free.	·088	·59	12·0	125·2	72·0	53·0	Free.	Suspicious.
59	Gronomes, Que.	W.H.G.	" 28	·084	·264	·018	·6	224·0	160·0	64·0	"	Excellent.
60	Banff, Alta.	D.P.B.	July 2	Free.	·028	·10	Free.	19·6	126·0	70·0	"	Wholesome.
61	Salmon Arm, B.C.	R.S.	" 2				8·0	1025·0	725·0	350·0		Slightly saline.
62	Covey Hill, Que.	T.E.	" 2	·07	·12	8·46	100·0	688·0	418·0	290·0	F. trace	Gravely suspicious.
63	"	T.E.	" 2	·20	·10	6·57	58·0	660·0	335·0	325·0	Free.	Seriously polluted.
64	Arnprior, Ont.	D. McP.	" 4	Free.	·05	2·71	34·5	440·0	276·0	164·0	Trace.	Polluted.
65	Coquitlam, B.C.	No. 108.	" 12	·015	·05	·087	Free.	14·0	6·6	7·4	Free.	Wholesome.
66	"	No. 109.	July 7	·02	·03	Free.	Free.	18·0	7·4	10·6	Free.	Wholesome.
67	"	No. 110.	" 7	Trace.	·02	"	"	13·0	5·0	8·0	"	"
68	"	No. 111.	" 7	·015	·03	"	"	88·0	6·6	2·2	"	"
69	Ottawa, Ont.	E.A.S.	" 14	3·16	·14	"	3400·0	6200·0	5704·0	496·0	"	Saline.
70	Granum, Alta.	J.B.N.	" 15				144·0	774·0	644·0	130·0		Fairly saline.
71	Ottawa, Ont.	C.E.F.	" 21	Free.	·016	·86	7·8	329·6	233·6	96·0	Free.	Wholesome.
72	Sturgeon Creek, Man.	D.A.D.	" 22	"	·030	1·17	37·1	1372·2	1034·4	337·8	"	Free from pollution.
73	Banff, Alta.	D.P.B.	" 24	Trace.	Trace.	·052	Free.	180·0	115·0	65·0	"	Pure and wholesome.
74	Nairn Centre, Ont.	J.B.H.	" 25	"	·23	1·33	10·4	296·0	98·0	198·0	"	Gravely suspicious.

75	Carrol, Man	E.G.S.	"	28				14·2	868·0	618·0	250·0		Slightly saline.
76	Wellington, Ont	C.A.P.	"	28				11·700	19906·0	17006·0	2900·0		Strongly saline.
77	Hull, Que	G.P.W	"	29	·004	·208	Free.	8·0	174·5	80·5	540·0	Trace	Suspicious.
78	Westboro, Ont.	W.H.H.	"	31	·220	·118	11·46	81·0	600·0	348·0	252·0	F. trace	Seriously polluted.
79	Grand View, Ont.	J.A.	Aug.	2	Free.	·18	·05	5·0	170·4	124·4	46·0	"	Free from pollution.
80	Fredericton, N.B.	E.F.	"	2	·025	·03	·58	2·0	114·0	74·0	40·0	Free.	Wholesome.
81	Isle Bizard, Que	F.D.M.	"	5	·08	·38	Free.	10·0	604·0	420·0	184·0	Heavy	Gravely suspicious.
82	Nicolet, Que	S. de la	"	5	8·71	·70	"	2550·0	5352·0	4956·0	396·0	Trace	Highly saline.
83	Coquitlam, B.C.	No. 112.	"	13	·07	·04	·058	Free.	16·8	6·4	10·4	Free.	Wholesome.
84	"	No. 113.	"	13	·03	·04	·008	"	14·4	5·8	8·6	"	"
85	"	No. 114.	"	13	·02	·04	Free.	"	13·6	6·2	7·0	"	"
86	"	No. 115.	"	13	·09	·09	"	"	14·4	8·4	6·0	"	"
87	Waseca, Sask	M.M.	"	15				13·5	332·0	164·0	16 80	Very heavy.	Non-patable.
88	Ancienne Lorette, Que	J.H.H.	"	18	Trace.	·03	4·16	14·5	181·2	81 2	100·0	Trace	Suspicious.
89	Banff, Alta	D.P.B.	"	16	Free.	·007	·058	Free.	191 6	138·0	53·6	"	Pure and wholesome.
90	Woodroffe, Ont.	G.J.F.	"	21	F. trace	·105	·0825	32 5	42·4	268·0	156·0	"	Suspicious.
91	Kerwood, Ont.	W.D.	"	22	1·180·0	·280		103 0	736·0	336·0	400·0		Gravely suspicious.
92	Gilpen, Alta.	R.D.McL	"	27	·74	3 20	Free.	14·0	1522·0	1135·0	387 0	Heavy.	Suspicious.
93	Hazledean, Ont.	R.H.G.	"	20	Free.	·66	"	10·0	262·0	190·0	72 0	Trace	Pure and wholesome.
94	Saltcoats, Sask	G.W.	Sept.	2				Heavy.	8140·0	6010·0	2130·0		Saline.
95	Black Creek, Ont.	G.S.G.	"	6	·44	·05	·20	150·0	3664 0	2824 0	840 0	Trace	Suspicious.
96	Jasper Park, Alta.	D.P.B.	"	9	Free.	·05	·066	Free.	138·0	96 0	42·9	Free.	Pure and wholesome.
97	Ottawa, Ont	C.E.F.	"	11	·04	·04	·97	8·0	336·0	212 0	124·0	"	" "
98	City View, Ont.	J.S.	"	12	·05	·04	2·12	45·0	338 0	170·0	168·0	F. trace	Suspicious.
99	Kakmak, Man.	M. de M.	"	13	·90	·06	Free.	1090·0	2912·0	2722·0	190·0	Free.	Saline.
100	Val. des Bois, Que.	J.L.	"	15	·06	·06	·18	2050·0	4286 0	3086·0	1200·0	"	"
101	Sidney, B.C	P.McC.	"	16	Free.	·10	Free.	2650·0	5630·0	4135·0	1495·0	"	Fairly saline.
102	Maxville, Ont.	E.McE.	"	20	7·48	1·80	"	285 0	2054·0	1312·0	742·0	"	Suspicious.
103	"	A.W.McE.	"	20	7·88	·44	"	180·0	860·0	545·2	314 8	"	Polluted.
104	"	J.T.D.	"	20	·08	·06	2·08	5 5	366·4	214 4	152·0	"	S spicious.
105	Bow. Is., Alta	C.A.	"	22	3·28	·06	Free.	18·5	3180·0	2916·0	264·0	"	Saline.
106	Coleman, Ita.	P.L.G.	"	25	Free.	·03	·27	Free.	2·2·0	140·0	92·0	"	Wholesome.
107	Britannia, Ont	J.H.	"	27	·12	·08	·42	26·0	220·0	144·0	76·0	"	Contaminated.
108	Lloydminister, B.C.	A.E.H.	"	27				340·0	6316·0	5292·0	1024·0	"	Saline.
109	Ottawa, Ont.	W.F.B.	Oct.	1	·86	·34	·20	40·0	1166·0	998 0	168·0	Heavy.	Suspicious.
110	Laroy, Alta.	P.W.	"	6	Free.	10	Free.	Free.	1775·0	1530 0	245 0	Free.	Wholesome.
111	"	P.W.	"	6	1·24	·07	·70	7·5	1675·0	1560·0	215·0	Very heavy.	Suspicious.
112	Jockvale, Ont.	P.H.	"	6	·24	·09	1·18	38·0	352 0	252·0	100·0	Trace	Seriously polluted.
113	"	P.H.	"	6	·02	·20	3·55	79·0	912·0	552 0	360·0	Very heavy.	Suspicious.
114	"	P.H.	"	6	Free.	·18	3·96	23 0	600·0	384·0	216·0	F trace	Polluted.
115	Ottawa, Ont.	L.C.	"	7	·25	·09	16·50	33·0	880·0	490·0	390 0	Free.	Non-potable.
116	Beauharnois, Que.	M.K.	"	7	·22	·10	·08	42·0	528·0	352·0	176 0	"	Suspicious.
117	Wakefield, Que	F.E.	"	7	Trace.	·15	·10	Free.	70·0	42 0	28·0	"	Pure and wholesome.
118	"	F.E.	"	7	Free.	08	7·69	97 5	752·0	424·0	328·0	Heavy.	Seriously polluted.
119	Westboro, Ont.	J.H.	"	11	·02	·03	5·36	3·5	257 6	125·6	132·0	Free.	Free from pollution.
120	Grand Manan, N.B.	A.B.C.	"	13	Free.	·01	·72	16 0	104·0	44 0	60·0	"	Satisfactory.
121	Ottawa, Ont	C.E.F.	"	13	·004	·04	·93	8·0	315·2	200 0	115·2	"	Wholesome.
122	Ardock, Ont	N.A.W.	"	16	·19	·11	660·0	17·0	506·0	328·0	178·0	"	Seriously polluted.
123	Fredericton, N.B.	E.F.	"	16	Free.	·04	·60	1·7	80·0	48·0	32·0	"	Free from pollution.
124	Grondin J. Que.	L.T.	"	28	·04	·05	1·0	1·0	202·0	132·0	70·0	"	Pure and wholesome.

RESULTS OF WELL WATERS, 1913-14.—Results Stated in Parts per Million.—*Continued.*

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 100° C.	Solid after Ignition.	Loss on Ignition.	Phosphates.	Report.
125	Penkill, Sask	A.T.H.	Nov. 7				54·0	4320·0	3280·0	1040·0		Saline.
126	Wakefield, Que.	G.P.	" 11	·08	·17	4·03	24·5	300·0	256·0	44·0	Free	Contaminated.
127	Saltcoats, Sask.	J.W.	" 13				22·0	6944·0	5592·0	1352·0		Saline.
128	Finch, Ont.	G.H.B.	" 18				130·0	641·6	423·6	218·0		
129	Vernon, Ont.	F.R.J.	" 20				24·5	744·0	464·0	280·0		Fairly saline.
130	Black Harbor, N.B.	C.B's	" 21	·20	·02	·165	35·0	340·0	318·0	22·0	Trace	Hard.
131	Meaford, Ont.	E.A.	" 26	1·76	·32	Free.	24·5	1506·0	1222·0	284·0	H. trace	Suspicious.
132	Ottawa, Ont.	R.O.G.C.	" 27	·075	·06	5·94	6·5	105·6	37·6	68·0	Free	"
133	"	C.E.F.	" 29	F. trace	·045	·89	8·0	314 0	213·6	100·4	"	Wholesome.
134	East View, Ont.	W.J.	Dec. 1	·25	·085	·22	36·0	472·0	356·0	116·0	"	Suspicious.
135	Walpole, Sask.	D.J.D.	" 1	4·58	·11	Free.	2200·0	4013·6	3887·6	126·0	Trace	Saline.
136	Finch, Ont.	G.H.B.	Dec. 2				135·0	648·8	385·6	263·2		
137	Fallowfield, Ont.	C.McK.	" 6	1·44	·40	5·25	70·0	516·0	414·4	101·6	Free	Seriously polluted.
138	" "	C.McK.	" 6	·05	·44	14·49	84·0	902·0	620·0	282·0	F. trace	" "
139	Benlay, Man.	H.D.F.	" 9	7·40	·22	Free.	1008·0	3468·0	3174·4	293·6	Free	Saline.
140	Westboro, Ont.	I.C.	" 9	·02	·04	·049	3·0	250·0	150·0	100.0	"	Pure and wholesome.
141	Mortlack, Sask.	J.L.	" 12				250·0	2160·0	1840·0	320·0	"	Saline.
142	Kelowna, B.C.	G.H.D.	" 15	·06	·10	·0825	Free.	112 0	72 0	40·0	Free.	Pure and wholesome.
143	Metcalfe, Ont.	G.A.W.	" 20	·01	·14	3·40	74·0	856·0	520·0	336 0	"	Gravely suspicious.
144	"	G.A.W.	" 20	4·80	·20	Free.	74·0	666·0	448·0	218·0	"	" "
145	Sonyja, Ont.	A.G.McK.	" 22	·03	·04	·074	Free.	256·0	170·0	86·0	"	Excellent.
146	Southey, Sask.	W.H.	" 26	2·52	4·52	·76	132·0	17950·0	13740·0	4210·0	"	Seriously polluted.
147	Cap Rouge, Que.	E.F.	" 27	·22	·23	Free.	·5	214·0	188·0	26·0	"	Suspicious.
148	Sault Ste. Marie, Ont.	M.W.S.	" 30	·18	·18	2·56	19·5	228·0	156·0	72·0	"	Free from organic pollution.
149	Holland, Man.	D.G.S.	Jan. 3	·86	26	·68	102·0	3280 0	2840 0	440·0	V. heavy	Saline.
150	Ottawa, Ont.	C.E.F.	" 2	·04	·04	·96	6 50	316·0	210·0	106 0	Free	Wholesome.
151	Asquit, Sask.	J.W.	" 17	·04	·23	Free.	26·0	3880·0	3552·0	328·0	"	Saline.
152	Meadows, Man.	E.L.R.	" 7	·88	·23	Free.	2850·0	7284·0	5824·0	1460·0	"	Highly saline.
153	Champion, Alta.	H.McN.	" 20	Free.	·075	11·55	24·0	2966·0	2588·0	378·0	"	" "
154	City View, Ont.	R.McE.	" 28	·08	·03	·066	75	196·0	172·0	24·0	"	Free from organic pollution.
155	Canford, B.C.	J.W.	" 28	Free.	·08	Free.	Free.	410·0	310·0	100·0	"	Excellent.
156	Ottawa, Ont.	D'A.S.	Feb. 7	·05	·07	8·91	11·5	305·0	105·0	200·0	"	Suspicious.
157	"	D'A.S.	" 7	·62	·44	·94	6·5	90·0	28 0	62·0	"	Seriously polluted.
158	"	D'A.S.	" 7	Free.	·033	1·39	Free.	105·0	60·0	45·0	"	Pure and wholesome.
159	Cap Rouge, Que.	E.F.	" 10	·04	·05	·33	Free.	248·6	213 0	35·0	"	Wholesome.

160	Southey, Sask	A.H.	"	27	Trace.	·17	Free.	2·00	376·0	248·0	128·0	"	"
161	South Ft George, B. C.	C.M.	Mar.	9	·06	·09	2·64	4	188·0	130·0	58·0	"	Contaminated.
162	Ottawa, Ont	C.E.F.	"	9	·02	·06	1·15	7·5	336·0	234·0	102·0	"	Wholesome.
163	Howell, Sask	J.V.	"	12	.....	.....	.....	120·0	7885·0	6185·0	1700·0	.....	Saline.
164	Bow Island, Alta	R.W.C.	"	16	·16	·07	Free.	·5	332·0	158·0	74·0	Free	Suspicious.
165	Cochrane, Alta	E.H.	"	17	·36	·26	Free.	·8	7520·0	6080·0	1440·0	"	Highly saline.
166	Big Valley, Alta	H.S.	"	20	.....	.....	.....	.....	1913·0	.....	.....	.....	Fairly "
167	Carp, Ont	E.McC.	"	24	·01	·16	·025	115·0	724·0	532·0	192·0	Free	Contaminated.
168	Enderby, B. C	P.W.C.	"	30	.....	.....	.....	.....	122·0	93·0	29·0	.....	

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
EXPERIMENTAL FARMS

REPORT

FROM THE

DIVISION OF FIELD HUSBANDRY

For the Year ending March 31, 1914.

PREPARED BY

Assistant Dominion Field Husbandman, Central Farm, Ottawa. O. C. White, B.S.A.

Superintendent—

Experimental Station, Charlottetown, P.E.I. - - - - - J. A. Clark, B.S.A.
Experimental Farm, Nappan, N.S. - - - - - - - W. W. Baird, B.S.A.
Experimental Station, Kentville, N.S. - - - - - - - W. Saxby Blair.
Experimental Station, Fredericton, N.B. - - - - - - W. W. Hubbard.
Experimental Station, Ste. Anne de la Pocatière, Que. - Joseph Bégin.
Experimental Station, Cap Rouge, Que. - - - - - - - Gus. A. Langelier.
Experimental Farm, Brandon, Man. - - - - - - - - W. C. McKillican, B.S.A.
Experimental Farm, Indian Head, Sask. - - - - - - T. J. Harrison, B.S.A.
Experimental Station, Rosthern, Sask. - - - - - - - Wm. A. Munro, B.A., B.S.A.
Experimental Station, Scott, Sask. - - - - - - - - R. E. Everest, B.S.A.
Experimental Station, Lethbridge, Alta. - - - - - - W. H. Fairfield, M.S.
Experimental Station, Lacombe, Alta. - - - - - - - G. H. Hutton, B.S.A.
Experimental Farm, Agassiz, B.C. - - - - - - - - - P. H. Moore, B.S.A.

REPORT

FROM THE

DIVISION OF FIELD HUSBANDRY.

CENTRAL EXPERIMENTAL FARM,

OTTAWA, March 31, 1914.

J. H. GRISDALE, Esq., B.Agr.,
Director of Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith reports of the work conducted by the Division of Field Husbandry at the Central Experimental Farm and the branch Experimental Farms and Stations during the year 1913.

As pointed out in the report for 1912 the work of this Division is of a very practical nature. Briefly, it may be said to consist of soil and crop management and agricultural engineering. Its scope is very well indicated in the following review of the main features dealt with in these reports:—

Weather conditions.
Crop yields.
Rotation of crops.
Cost of production of field crops.
Weed eradication.
Soil cultivation.
Use of barnyard manure and commercial fertilizers.
Irrigation and underdrainage.
Clearing land, fencing, etc.

In explanation of the comparatively small number of field experiments at the Central Experimental Farm, attention may be drawn again to the present lack of sufficient land suitable for such purposes. The soil, other than that devoted to experiments herein reported upon, is so variable in composition that satisfactory field tests are practically impossible. The agriculture of the districts we serve is sufficient evidence of the need for conducting soil cultivation tests and more comprehensive rotation investigations. Such lines of work require to be under investigation for a long series of years, and at the present price of land in the vicinity of Ottawa would no doubt involve considerable expense, but if the Division is to render the best service possible more land of suitable quality must be made available.

I have the honour to be, sir,
Your obedient servant,

O. C. WHITE,
Assistant Dominion Field Husbandman.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

REPORT OF THE ASSISTANT DOMINION FIELD HUSBANDMAN— O. C. WHITE, B.S.A.

WEATHER CONDITIONS AND CROP NOTES, 1913.

The season of 1913 will be recorded as one of the worst in the history of the Ottawa valley. Clovers, as a rule, came through the winter in a weakened condition, and were in many cases completely killed out during the alternate freezing and thawing of the early part of April. Seeding was commenced on the average date for the previous ten years, namely, the twenty-third day of April, and was continued under favourable conditions until its completion. Mangels, potatoes and corn were practically all sown by the end of May, though the weather became colder and rather more unfavourable towards the latter part of the month, and on farms where drainage was not good seeding of corn was delayed into June. The drought of this month materially reduced the yields of all field crops. Late-sown roots, especially turnips, germinated poorly, hay made very slow growth, and pastures became badly burned up towards the end of the month. July continued comparatively dry and very hot. Corn, roots and potatoes suffered greatly, oats made scarcely any growth, and hay, a great deal of which was left standing in the hope that rain would ultimately come and improve it, was literally burned up. Our average yield of two tons per acre cannot be taken as a criterion of yields throughout the district. 'Not half a crop' was the general comment of farmers in the vicinity. Temperatures in August continued high, and while more rain fell than in July, comparatively dry weather obtained until near the end of the month. These rains helped the root and corn crop considerably, but were too late to ensure any material growth of straw. Grain filled fairly well, however, and both yield and quality were much better than was promised early in the season. At the Farm here approximately 55 acres of oats were harvested, the average yield being 50 bushels per acre. September was exceptionally fine, but frosts on the 15th and 16th did much damage to corn, which yielded considerably below the average here, and very much below throughout the locality. On the Farm, cutting began on the 20th of the month and the corn was practically all ensiled by the 30th. October was a splendid month for the growth and harvesting of roots, which, in spite of their poor beginning, yielded almost up to the average returns for this Farm. The weather continued very open and mild until late November, final freezing up occurring on the 28th of the month.

The following records regarding field operations and the weather may be of interest:—

First date of sowing field grain, 1913	April 23.
First date of sowing field grain, average of eleven years	April 23.
Earliest date of sowing field grain, 1903 to 1913	April 10 (1910).
Latest date of commencing seeding field grain, 1903 to 1913	May 4 (1904).
First date of sowing mangels, 1913	April 26.
Date of sowing potatoes, 1913	May 15.
First date of sowing corn, 1913	May 23.
Date of commencing hay harvest, 1913	July 7.
Date of commencing grain harvest, 1913	August 2.
Date of commencing corn cutting, 1913	September 20.
Date of harvesting mangels, 1913	October 27.
Date of freezing up, 1913	November 28.
Average date of freezing up, 1903-1913	November 23.
Earliest date of freezing up, 1903-1913	Nov. 15 (1911).
Latest date of freezing up, 1903-1913	Dec. 1 (1908).

SOME WEATHER OBSERVATIONS taken at Central Experimental Farm, Ottawa, 1913.

MONTH.	TEMPERATURE F.			PRECIPITATION.				Total Sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	Heaviest in 24 hours	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	20·90	42·0	−16·0	2·17	23·75	4·54	0·92	94·4
February	10·60	37·8	−18·0		23·50	2·35	0·70	124·2
March	26·18	58·8	−14·2	2·20	24·25	4·62	0·60	107·7
April	45·34	86·5	21·0	2·00	S.	2·00	0·78	219·8
May	53·73	89·0	28·8	2·39		2·39	0·76	244·8
June	64·21	93·2	35·0	0·82		0·82	0·25	309·0
July	70·05	100·0	44·8	2·30		2·30	0·98	278·9
August	67·05	97·2	38·0	3·13		3·13	1·70	258·6
September	56·83	88·0	30·0	2·69		2·69	0·91	222·5
October	50·41	78·2	22·0	4·08	S.	4·08	1·02	134·3
November	37·90	63·2	17·2	2·48	2·00	2·68	0·92	106·7
December	23·47	42·6	− 5·0	0·58	17·00	2·28	0·76	77·6
Total for year				24·84	90·50	33·88		
Average for eleven years						33·29		
Total for six growing months, April to September, 1913						13·33		
Average of eleven years for six growing months, April to September						17·43		

FIELD CROP YIELDS.

The following table summarizes the yields of field crops at the Central Farm in 1913. As pointed out above, they are considerably below the average of past years.

YIELDS of Field Crops, Central Farm, 1913.

Crop.	Area.	Total yield.		Average yield per acre.	
	Acres.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
Oats	50·00		2,500		50
Oat straw	50·00	54 680		1 173	
Corn	43·00	516		12	
Roots (mangels)	3·00	48	1,600	16	533 20
Potatoes	4·00	25 1,994	866 34	6 998	216 38
Hay	60·00	120		2	

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SESSIONAL PAPER No. 16

COST OF PRODUCTION OF FIELD CROPS.

Because of the comparatively low yields in 1913 the cost of production per unit was high. Figures are given herewith for corn, mangels, hay, and oats grown in large lots under ordinary field conditions.

COST OF PRODUCTION OF MANGELS.

Two acres of mangels were grown in a four-year rotation of mangels, grain, clover hay, timothy hay. The timothy hay field was ploughed shallow early August, top worked and ribbed up late autumn in part preparation for the mangels.

Number of acres: 2.	
Rent of land at $3 per acre	$6 00
Use of machinery at 60 cents per acre	1 20
Quarter share of manure, at rate of 15 tons per acre, at $1 per ton.	7 50
Ploughing in autumn, 8 hours 3-horse team at 41 cents	3 28
Discing in autumn, 6 hours 4-horse team at 48 cents	2 88
Ribbing in autumn, 2 hours 2-horse team at 34 cents	68
Discing in spring, 3 hours 4-horse team at 48 cents	1 44
Discing, 4 hours 3-horse team at 41 cents	1 64
Harrowing, 1 hour 2-horse team at 34 cents	34
Rolling, 2 hours 2-horse team at 34 cents	68
Drilling, 4 hours 2-horse team at 34 cents	1 36
Seed, 20 pounds at 25 cents	5 00
Sowing, 12 hours manual labour at 17 cents	2 04
Hoeing, 60 hours manual labour at 17 cents	10 20
Cultivating, 7½ hours 2-horse team at 34 cents	2 55
Cultivating, 4 hours single horse at 27 cents	1 08
Pulling, loading and unloading, 118 hours manual labour at 17 cents.	20 06
Hauling, 14 hours 2-horse team at 34 cents	4 76
Total cost for 2 acres	$72 69
Cost per acre	36 35
Yield per acre ....bush.	566
" " ....tons.	17
Cost per bushel ....cents.	6.22
Cost per ton	$2.14

COST OF PRODUCTION OF ENSILAGE CORN.

Eighteen acres of ensilage corn were grown in a three-year rotation of corn, grain, clover hay. The land was manured at the rate of 18 tons per acre and spring ploughed for corn, turning under the manure and the growth of clover.

Number of acres: 18.	
Rent of land at $3 per acre	$54 00
Use of machinery at 60 cents per acre	10 80
Third share of manure, at rate of 18 tons per acre, at $1 per ton.	108 00
Ploughing, 71 hours 3-horse team at 41 cents	29 11
Discing, 25 hours 4-horse team at 48 cents	12 00
Discing, 7 hours 3-horse team at 41 cents	2 87
Seed, 9 bushels at $2 per bushel	18 00
Seeding, 9½ hours 2-horse team at 34 cents	3 23
Rolling, 9½ hours 2-horse team at 34 cents	3 23
Cultivating (three times), 54 hours 2-horse team at 34 cents	18 36
Cultivating, 36 hours single horse at 27 cents	9 72
Hoeing, 144 hours manual labour at 17 cents	24 48
Cutting, 30 hours 3-horse team at 41 cents	12 30
Hauling, 102 hours 2-horse team at 34 cents	34 68
Loading, unloading, tramping, etc., 298 hours manual labour at 17c.	50 66
Man at engine, 30 hours manual labour at 17 cents	5 10
Total cost for 18 acres	$396 54
Cost per acre	22 03
Yield per acre ....tons.	12
Cost per ton	$1 84

COST OF PRODUCTION OF OATS.

Thirty-five acres of oats were grown in a three-year rotation of corn, oats, clover hay. The corn ground was shallow ploughed in the autumn. With the oats there was seeded a heavy mixture of timothy and clovers.

Number of acres: 35.	
Rent of land at $3 per acre	$105 00
Use of machinery at 60 cents per acre	21 00
Third share of manure, at rate of 18 tons per acre, at $1 per ton	210 00
Discing in autumn, 56 hours 3-horse team at 41 cents	22 96
Ploughing in autumn, 43 hours 4-horse team at 48 cents	20 64
Discing in spring, 56 hours 4-horse team at 48 cents	26 88
Harrowing, 12 hours 3-horse team at 41 cents	4 92
Seed, at $1 per acre	35 00
Seeding, 20 hours 3-horse team at 41 cents	8 20
Cutting, 25 hours 3-horse team at 41 cents	10 25
Twine, 105 pounds at 12 cents	12 60
Stooking, 61 hours manual labour at 17 cents	10 37
Loading, 52 hours manual labour at 17 cents	8 84
Hauling, 39 hours 2-horse team at 34 cents	13 26
Raking, 12 hours single horse at 27 cents	3 24
Threshing, 1,820 bushels at 2½ cents per bushel	45 50
Total cost for 35 acres	$358 66
Cost per acre	15 96
Yield of grain per acre ..... bush.	52
Yield of straw per acre ..... tons.	1.16
Cost per bushel of grain (grain valued at 34 cents per bushel and straw at $4 per ton) ..... cents	24.31
Cost per ton of grain ..... $	14 30
Cost per ton of straw	2 86

NOTE.—The relative costs of grain and straw are estimated in the following manner:—

Total revenue per acre from grain and straw is [52 bushels at 34 cents] + (1.16 tons at $4) = $22.32.

When revenue is $22.32 cost to produce is $15.96.

When revenue (from 52 bushels grain) is $17.68, cost to produce 1 bushel is $\frac{17.68 \times 15.96}{22.32 \times 52} = 24.31$ cents.

When revenue (from 1.16 tons straw) is $4.64, cost to produce per ton is $\frac{4.64 \times 15.96}{22.32 \times 1.16} = \$2.86$.

COST OF PRODUCTION OF HAY.

Thirty-three and one-half acres of hay were grown in a three-year rotation of corn, oats, clover hay. Owing to the winter killing of the clover and to the excessive drought during the growing season the yield was low, and in consequence the cost of production per ton was comparatively high.

Number of acres: 33.5.	
Rent of land at $3 per acre	$100 50
Use of machinery at 60 cents per acre	20 10
Third share of manure, at rate of 18 tons per acre, at $1 per ton	201 00
Seed:—10 pounds red clover at 28 cents; 2 pounds alsike at 30 cents; 6 pounds alfalfa at 22 cents; 6 pounds timothy at 7½ cents	5 17
Cutting, 26 hours 2-horse team at 34 cents	8 84
Raking, 25 hours single horse at 27 cents	6 75
Coiling, 60 hours manual labour at 17 cents	10 20
Loading and unloading, 117 hours manual labour at 17 cents	19 89
Hauling, 65 hours 2-horse team at 34 cents	22 10
Total cost for 33.5 acres	$394 55
Cost per acre	11 78
Yield per acre ..... tons.	2
Cost per ton	$5 89

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The following table summarizes in a form convenient for reference, the cost of production of mangels, corn, oats and hay as given in detail above:—

Cost of Production of Field Crops, Central Farm, 1913.

Crop.	Area.	Yield per acre.		Cost to produce.		
				Per acre.	Per ton.	Per bushel.
	Acres.	Tons.	Bush.	$ cts.	$ cts.	Cents.
Mangels	2·00	17	584	36 35	2 14	6·22
Ensilage corn	18·00	12	.....	22 03	1 84	.....
Oats	35·00	.....	52	15 96	14 30	24·3
Oat straw	.....	1·16	.....	.....	.....	.....
Hay	33·5	2	.....	11 78	5 89	.....

ROTATION OF CROPS.

That certain crops do better when following after certain other crops, has long been known. Farm practice, however, seldom keeps pace with knowledge in such matters, and to this particular phase of crop management work especially, too little consideration is usually given.

For the past ten years experiments have been carried on at this Farm to determine the relative value of different rotations suitable for live stock purposes. Before presenting the results of this work in detail we may briefly answer the following questions that naturally arise in a consideration of this subject:—

What is meant by a systematic rotation of crops?

It is a certain regular succession of crops so arranged that, after each, the land is left in the best possible condition to receive the crop which follows.

Why does the order in which crops follow each other make a great difference in the yields from year to year?

1. Because different plants have different manurial requirements.
2. Because plants vary in their power to abstract certain foods from the soil.
3. Because all plants do not feed to the same depth in the soil.
4. Because all plants are not alike in the residues they leave behind.
5. Because some plants tend to produce better tilth than others.
6. Because plants vary in their resistance power to bacterial and fungus diseases and to insect enemies.

What are the requirements of any rotation before it may be considered suitable?

1. It must supply the crops needed in the proper proportions.
2. It must be so constituted that weeds can be kept under control.
3. It must yield a reasonable net profit.
4. It must, under properly regulated treatment, maintain soil fertility.

Why should every farmer place his farm under some definite system of cropping, or, in other words, adopt a rotation of crops?

1. Because it will increase crop yields and net profits.
2. Because the cost of fencing, on farms where live stock is kept, would be materially reduced, since it would be necessary to fence off only three, four or five fields instead of ten or twelve, as is often done.

Ottawa.

3. Because larger machinery could be used. Where fields are fewer they must be larger, and large fields lend themselves better than small ones to the use of large machinery which lowers cost of production.

4. Because all cultural operations of one kind would be in one field, thus lowering the cost by reducing the travelling necessary from one small field to another.

5. Because every field would receive, at regular intervals, its fair proportion of manure. No field would therefore be favoured to the disadvantage of the rest of the farm, and the whole farm would always be kept up to its highest producing possibilities.

The line of farming engaged in must, however, determine to a great extent the kind and relative amounts of crops that shall be grown, and may, in some cases, prevent following to the letter the rotation that would provide the largest returns. In any case it may be said that a good rotation will include: (1) meadow or pasture, (2) roots, corn, or other hoed crop, and (3) some cereal crop. The results of our experiments go to show that for greatest profits these crops should follow each other in the order named.

The following rotations have been devised to meet different requirements. One or the other of them is likely to be found suitable for conditions that obtain on the average live stock farm in Eastern Ontario and Quebec.

ROTATION "A" (FIVE YEARS' DURATION).

First year.—Hoed crop. When corn is the hoed crop used, manure is applied in spring at rate of 15 tons per acre and shallow ploughed shortly before planting time, turning under clover and manure. After the hoed crop is harvested, land is shallow ploughed or cultivated.

Second year.—Grain. Seeded down with 8 pounds red clover, 2 pounds alsike and 10 pounds timothy per acre.

Third year.—Clover hay. Two crops expected. Top dressed in fall with manure at rate of 15 tons per acre.

Fourth year.—Timothy hay. Field ploughed in August, top worked and ribbed up in October.

Fifth year.—Grain. Seeded down with 10 pounds red clover, which is allowed to grow to be turned under following spring when the hoed crop is corn.

This rotation has proven an excellent one here. When carefully followed, and when cultural operations were well performed, weeds have been kept under fair control, and crop yields have been maintained. One-fifth of the land is in hoed crop, two-fifths in grain, one-fifth in clover hay, and one-fifth in timothy hay or pasture. It supplies a relatively larger proportion of grain to roots and hay than the ordinary three or four-course rotation, and for that reason would be preferable where considerable grain is called for.

ROTATION "B" (FIVE YEARS' DURATION).

First year.—Hoed crop. When corn is the hoed crop used, manure is applied in spring at rate of 15 tons per acre, and shallow ploughed shortly before planting time, turning under both clover and manure.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 5 pounds timothy per acre. New seeding top dressed in fall with 15 tons barnyard manure per acre.

Third year.—Hay. Two crops expected. Ploughed late fall.

Fourth year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 5 pounds timothy per acre.

Fifth year.—Clover hay. Two crops expected.

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Though the arrangement is different, this rotation is very similar to "A" in the relative amounts of the different crops it supplies. In "A" both clover and timothy hay are provided, whereas in "B" clover hay only is grown. "B" has maintained crop yields, and has given profits equal to "A" in the tests so far conducted, but, as indicated, does not answer the purpose where a certain proportion of timothy hay is called for. It can, however, be very easily extended into a six or seven-year rotation to include timothy hay or pasture. As a seven-year rotation the crops would succeed each other in the following order:—

Hoed crop; grain, seeded down with clover and timothy; clover hay; timothy hay or pasture; grain, seeded down with clover and timothy; clover hay; timothy hay or pasture.

ROTATION "C" (FOUR YEARS' DURATION.)

First year.—Hoed crops.

Second year.—Grain. Seeded down with 10 pounds red clover and 12 pounds timothy per acre.

Third year.—Clover hay. Two crops expected.

Fourth year.—Timothy hay. Field ploughed in August, manured at rate of 24 tons per acre, worked at intervals and ridged up in late fall in preparation for hoed crops.

This rotation is most satisfactory from all standpoints, except that it supplies a rather smaller proportion of grain than is often desired. Where live stock is the mainstay of the farm, this is, however, a very minor fault. The turning of a shallow furrow when ploughing sod in preparation for grain or corn has been found to be good practice here. In preparing for roots, deeper ploughing or the regular plough with subsoiler is to be advised.

ROTATION "D" (THREE YEARS' DURATION.)

First year.—Hoed crop. For corn, manure is applied in spring at rate of 18 tons per acre, and shallow ploughed shortly before corn planting time, turning under both clover and manure. For roots, land should be ploughed previous fall.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike, 6 pounds alfalfa and 6 pounds timothy per acre.

Third year.—Clover hay. Two crops expected.

This would be a most excellent rotation to put into practice where sufficient rough land is available to serve as pasturage. It is the rotation that would supply the greatest amount of forage of the best description for dairying or beef production. It is better for heavy than for light soils.

ROTATION "R" (THREE YEARS' DURATION.)

First year.—Corn. Manure applied in spring at rate of 18 tons per acre. Shallow ploughed shortly before corn planting time, turning under both clover and manure.

Second year.—Peas and oats mixed. Cut green for cattle. Seeded down with 10 pounds red clover, 2 pounds alsike, 6 pounds alfalfa and 6 pounds timothy per acre.

Third year.—Clover hay. Cut green for cattle.

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This is a rotation specially designed to supply soiling crops. Two years' records only have been kept.

If a careful examination of the above rotations be made there will be noted a few desirable characteristics common to all:—

1. Grain fields are always seeded down with clover, even though it be used only as a fertilizer, as in the case of the fifth year of rotation "A."
2. Grass and clover seedings are heavy. Increased crops of hay and rare failures of a catch have justified them.
3. Hoed crops form a large proportion of every rotation. An attempt to farm a small area without a hoed crop was not successful. Weeds could not readily be kept in check.
4. No field is left in hay for more than two successive years. Our records show that the second crop almost always costs more per ton than the first, and that succeeding crops are very liable to be grown at a loss.
5. Barnyard manure is applied frequently, in comparatively small quantities, rather than at long intervals, in large quantities.

In order that the net profits (profits after deducting cost of rent, all manual and horse labour, manure, seed, twine and use of machinery) as well as the yields of these rotations might be determined, careful records have been kept of all items chargeable against the rotations.

The following values have been fixed and are being used in this, and similar work, on all the Eastern Farms and Stations:—

Cost Values.

Manual labour	$0 17 per hour.
Horse labour, including teamster—	
Single horse	27 "
2-horse team	34 "
3 horse team	11 "
4-horse team	48 "
Additional horses, each	7 "
Rent	3 00 per acre.
Machinery (inclusive of threshing machinery)	60 "
Barnyard manure (spread)	1 00 per ton.
Commercial fertilizers charged at cost.	
Seed wheat, oats, barley, buckwheat and rye	1 00 per acre.
Seed peas	2 00 "
Turnip, mangel, potato and corn seed charged at cost.	
Grass and clover seed charged at cost, total cost to be distributed over the number of years in hay and pasture.	
Twine charged at cost.	
Threshing charged according to actual labour expended, the items charged under this head to include only such operations as begin after the load of grain arrives at the feed table, or after the grain is stacked or placed in the mow ready to be thrown on the feed table. Loading, hauling, etc., to be charged to manual and horse labour.	

Return Values.

Wheat, oats, barley, rye and buckwheat	$0 01 per pound.
Peas	1½ "
Hay (timothy, clover, alfalfa or mixed)	7 00 per ton.
Straw (wheat, oat, barley, rye, buckwheat or peas)	4 00 "
Corn ensilage	2 00 "
Sugar beets	3 00 "
Pasture rent (grass)	2 00 "
Pasture rent (grass and clover mixed)	2 00 "
Potatoes	40 per bushel.
Pasture—	
Horses per head	1 00 per month.
Cattle per head	1 00 "
Sheep per head	25 "

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The items for which there are no fixed charges have been valued as follows:

Twine	$ 12 per pound.
Red clover	28 00 per 100 pounds.
Alsike clover	30 00 "
Alfalfa	22 00 "
Timothy	1 50 per bushel.
Seed corn	7 50 "
Mangel seed	25 per pound.

The season of 1913 was so extremely dry that many of our crops were grown at a loss. The returns are, therefore, very low as compared with the average returns for preceding years. A rearrangement of the rotations was made in 1912, hence averages have been drawn for the preceding eight years only.

COSTS, RETURNS and NET PROFITS of Rotations "A," "B," "C," "D" and "R," 1904-11.

Rotation.	Cost to operate per acre.	Value of returns per acre.	Profit or loss per acre, 1913.	Profit, average of 8 years, 1904-11.
	$ cts.	$ cts.	$ cts.	$ cts.
A (Five years' duration)	17 55	19 40	1 85	8 78
B (Five ")	21 83	21 47	— 36	9 03
C (Four ")	17 08	16 97	— 11	8 15
D (Three ")	19 35	17 80	—1 55	10 08
R (Three ")	19 14	19 50	36*	

*Records kept for 1912-13 only.

COSTS, RETURNS and NET PROFITS of Rotations "A," "B," "C" and "D," 1904-11.

Year.	COST PER ACRE TO OPERATE.				VALUE PER ACRE OF RETURNS.				NET PROFIT PER ACRE.			
	A.	B.	C.	D.	A.	B.	C.	D.	A.	B.	C.	D.
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
1904	14 37	14 59	19 8[illegible]	15 73	24 33	23 58	22 98	27 25	9 96	8 99	3 09	11 52
1905	16 30	17 96	22 8[illegible]	18 31	26 86	29 81	36 74	29 96	10 56	11 85	13 86	11 65
1906	15 54	15 16	19 3[illegible]	14 56	23 67	21 19	25 06	21 65	8 13	6 09	5 71	7 09
1907	14 63	14 83	20 13	17 30	24 97	26 34	27 6	26 91	10 34	11 51	7 50	9 61
1908	14 16	13 70	15 84	15 07	19 07	17 43	20 21	19 26	4 91	3 73	4 37	4 19
1909	13 50	14 38	16 65	13 48	19 18	22 64	25 64	24 74	5 68	8 26	8 99	11 26
1910	13 56	13 48	13 67	14 77	23 54	22 92	23 36	28 86	9 98	9 44	9 69	14 09
1911	14 20	14 29	14 24	14 18	24 85	26 65	26 25	25 43	10 65	12 36	12 01	11 25
Total	116 26	118 3[illegible]	142 65	123 40	186 47	190 56	207 87	204 06	70 21	72 23	65 22	80 66
Average for 8 years	14 53	14 7[illegible]	17 8[illegible]	15 43	23 31	23 82	25 98	25 51	8 78	9 03	8 15	10 08

The following tables contain details in

ROTATION

Rotation Year.	Crops. 1912.	Crops. 1913.	Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Horse labour (including teamster.) Hours. Single horse.	2-horse team.	3-horse team.	4 horse team.	Cost of horse labour.
			Ac.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	$ c.
1st...	Oats	Corn	1·00	9 56	1 77	42	7 14	1½	12½	5½	2½	8 11
2nd...	Corn	Oats	1·00	9 56	1 91	3	0 51	½	1½	5¼	1½	3 52
3rd...	Oats	Hay	1·00	9 56	2 40	6	1 02	½	2½			0 99
4th...	Hay	Hay	1·00	9 56	2 40	6	1 02	½	2½			0 98
5th...	Hay	Grain	1·00	9 56	1 91	3	0 51	½	1½	5¼	1½	3 52
	Aggregate		5·00	47 80	10 39	60	10 20	3½	20½	16	5½	17 12
	Average per acre in 1913											

ROTATION

1st...	Hay	Corn	1·00	9 00	1 77	38	6 46	1½	10½	5½	2½	7 43
2nd...	Corn	Oats	1·00	9 00	1 91	3	0 51	½	1½	5¼	1½	3 52
3rd.	Oats	Hay	1·00	9 00	4 37	6	1 02	½	2½			0 99
4th...	Hay	Oats	1·00	9 00	2 02	2½	0 42	½	2	5¼	1½	3 69
5th...	Oats	Hay	1·00	9 00	4 37	5	0 85	½	2½			0 98
	Aggregate		5·00	45 00	14 44	54½	9 26	3½	19	16	5½	16 61
	Average per acre in 1913											

ROTATION

1st...	Hay	Corn	1·00	9 00	1 77	41	6 97	1½	11½	5½	2½	7 77
2nd...	Corn	Oats	1·00	9 00	1 97	3	0 51	½	1½	5¼	1½	3 52
3rd.	Grain	Hay	1·00	9 00	2 45	5	0 85	½	2½			0 99
4th.	Hay	Hay	1·00	9 00	2 45	4½	0 77	½	2½			0 98
	Aggregate		4·00	36 00	8 64	53½	9 10	3	18	10¾	4	13 26
	Average per acre in 1913											

ROTATION

1st.	Hay	Corn	1·00	9 00	1 77	40	6 80	1½	11½	5½	2½	7 77
2nd...	Corn	Oats	1·00	9 00	1 91	2¼	0 38	½	1½	5¼	1½	3 52
3rd...	Oats	Hay	1·00	9 00	5 77	5	0 85	½	2½			0 98
	Aggregate		3·00	27 00	9 45	47¼	8 03	2½	15½	10¾	4	12 27
	Average per acre in 1913											

connection with these rotations in 1913:—

"A."

In raising Crop.					Particulars of Crop.						
					Weight.						
Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Grain.	Straw.	Hay.	Roots, ensilage or green feed.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	$ c.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
.....	26 58	26 58	.....	1 80	.....	.....	.....	29,530	29 53	29 53	2 95
1 16	16 66	16 66	0 39	.....	1,45	1,622	.....	.....	17 82	17 82	1 16
.....	13 97	13 97	.....	6 02	.....	.....	4,640	.....	16 24	16 24	2 27
.....	13 96	13 96	.....	6 00	.....	.....	4,650	.....	16 27	16 27	2 31
1 11	16 61	16 61	0 41	.....	1,38	1,631	.....	.....	17 15	17 15	0 54
2 27	87 78	87 78	.....	.....	28 47	3,253	9,290	29,530	97 01	97 01	9 23
.....	.....	17 55	.....	.....	.....	.....	.....	.....	.....	19 40	1 85

"B."

.....	24 66	24 66	.....	2 37	.....	.....	.....	20,760	20 76	20 76	−3 90
0 93	15 87	15 87	0 46	.....	1,170	1,120	.....	.....	13 94	13 94	−1 93
.....	15 38	15 38	.....	5 49	.....	.....	5,600	.....	19 60	19 60	4 22
1 06	16 19	16 19	0 41	.....	1,326	3,694	.....	.....	20 65	20 65	4 46
.....	15 20	15 20	.....	9 74	.....	.....	3,120	.....	10 92	10 92	−4 28
1 99	87 30	87 30	.....	.....	2,496	4,814	8,720	20,760	85 87	85 87	−1 43
.....	.....	21 83	.....	.....	.....	.....	.....	.....	.....	21 47	−0 36

"C."

.....	25 51	25 51	.....	1 85	.....	.....	.....	27,530	27 53	27 53	2 02
1 31	16 31	16 31	0 34	.....	16 41	2,084	.....	.....	20 58	20 58	4 27
.....	13 29	13 29	.....	9 23	.....	.....	2,880	.....	10 08	10 08	−3 21
.....	13 20	13 20	.....	9 60	.....	.....	2,770	.....	9 69	9 69	−3 51
1 31	68 31	68 31	.....	.....	16 41	2,084	5,650	27,530	67 88	67 88	−0 43
.....	.....	17 08	.....	.....	.....	.....	.....	.....	.....	16 97	−0 11

"D."

.....	25 34	25 34	.....	2 11	.....	.....	.....	24,030	24 03	24 03	−1 31
1 30	16 11	16 11	0 34	.....	1,628	1,197	.....	.....	18 67	18 67	2 56
.....	16 60	16 60	.....	10 85	.....	.....	3,060	.....	10 71	10 71	−5 89
1 30	58 05	58 05	.....	.....	1,628	1,197	3,060	24,030	53 41	53 41	−4 64
.....	.....	19 35	.....	.....	.....	.....	.....	.....	.....	17 80	−1 55

ROTATION

Rotation year.	Crops.		Area.	Items of Expense								
				Rent and manure.	Seed, twine and use of machinery.	Manual labour.		Horse labour (including teamster.)				
								Hours.				Cost of horse labour.
						Hours.	Cost.	Single horse.	2-horse team.	3-horse team.	4-horse team.	
	1912.	1913.	Ac.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	$ c.
1st	Hay	Corn	1·60	14 40	2 83	50	8 50	2½	15¼	8½	3¼	11 15
2nd	Corn	Mixed peas and oats	1·60	14 40	3 36	20	3 40	2	10	6¼	2	7 46
3rd	Mixed peas and oats	Hay	1·60	14 40	9 23	6½	1 10	1	4	.....	.....	1 63
	Aggregate		4·80	43 20	15 42	76½	13 00	5½	29¼	14¾	5¼	20 24
	Average per acre in 1913		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

IN RAISING CROP.					PARTICULARS OF CROP.						
					Weight.						
Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Grain.	Straw.	Hay.	Roots, ensilage or green feed.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	$ c.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
.....	36 88	23 05	.....	1 93	.....	.....	.....	38,300	38 30	23 94	0 89
.....	28 62	17 89	.....	1 90	.....	.....	.....	30,140	30 14	18 84	0 95
.....	26 36	16 47	.....	7 33	.....	.....	7,190	.....	25 16	15 72	−0 75
.....	91 86	57 41	.....	.....	.....	.....	7,190	68,440	93 60	58 50	1 09
.....	.....	19 14	.....	.....	.....	.....	.....	.....	.....	19 50	0 36

SHALLOW PLOUGHING AND SUBSOILING *versus* DEEP PLOUGHING.

This experiment has now been under way for ten years. Two four-year rotations, differing only in the above-mentioned methods of preparation for hoed crop, were laid down in 1904.

ROTATION "S" (SHALLOW PLOUGHING AND SUB-SOILING).

First year.—Corn or roots. Field manured at rate of 24 tons per acre. Ploughed out of sod previous August, 4 inches deep, subsoiled to a depth of 8 or 9 inches and ridged up in late autumn. The land is ploughed shallow or cultivated in preparation for the grain which follows.

Second year.—Grain. Seeded down with 10 pounds red clover and 12 pounds timothy per acre.

Third year.—Clover hay. Cut twice in the season, and the aftermath left on the field.

Fourth year.—Timothy hay. Broken in August and prepared for corn or roots, as indicated above.

ROTATION "D" (DEEP PLOUGHING).

This rotation differs from rotation "S" only in the treatment of the timothy hay field in preparation for corn or roots. It is manured and ploughed in August, 7 inches deep, top-worked, and ploughed again in late fall, 7 inches deep.

The average returns for the ten years show a very slight advantage in favour of the deep ploughing. If there is taken into consideration the fact that where subsoiling is practised a single plough must be used, whereas a two-furrow riding plough may be operated under the deep-ploughing method, the higher cost of operation in the former method would reduce the actual net profits still more. This experiment will be continued, as the results have not as yet shown any decided advantage in favour of either method.

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Costs, Returns and Net Profits of Rotations "S" and "P," Average of 10 Years.

Year.	Cost to operate per acre.		Value of returns per acre.		Net profit per acre.	
	S.	P.	S.	P.	S.	P.
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1904	19 89	19 89	22 98	22 98	3 09	3 00
1905	22 88	22 89	36 74	36 89	13 86	14 00
1906	19 35	19 39	25 06	24 93	5 71	5 54
1907	20 13	20 29	27 63	27 41	7 50	7 12
1908	15 84	16 03	20 21	20 34	4 37	4 31
1909	16 65	17 05	25 64	25 80	8 99	8 75
1910	13 67	14 42	23 36	23 60	9 69	9 18
1911	14 24	14 53	26 25	26 72	12 01	12 19
1912	19 47	19 02	27 14	28 99	7 67	9 97
1913	18 13	17 52	17 71	18 34	42	82
Total	180 25	181 03	252 72	256 00	72 47	74 97
Average for 10 years	18 02	18 10	25 27	25 60	7 25	7 50

The following tables contain details of these rotations

ROTATION "S" (SHALLOW

Rotation year.	Description of Soil.		Crops.		Area.	Items of				
	Surface Soil.	Subsoil.				Rent and manure.	Seed, twine and use of machinery.	Manual labour.		Horse
								Hours	Cost.	Single horse
			1912.	1913.	Acres.	$ c.	$ c.	No.	$ c.	No.
1st	Sandy loam	Clay hard-pan	Hay.	Corn	1·00	9·00	1·77	37	6·29	1
2nd	"	"	Corn.	Oats	1·00	9·00	1·91	3	·51	½
3rd	"	"	Oats	Hay.	1·00	9·00	2·45	5	·85	½
4th	"	"	Hay.	Hay.	1·00	9·00	2·45	5	·85	½
	Aggregate				4·00	36·00	8·58	50	8·50	3
	Average per acre in 1913									

ROTATION "P"

1st	Sandy loam	Clay hard-pan	Hay	Corn	1·00	9·00	1·77	39	6·63	1½
2nd	"	"	Corn	Oats	1·00	9·00	1·91	3	·51	½
3rd	"	"	Oats	Hay	1·00	9·00	2·45	5	·85	½
4th	"	"	Hay	Hay	1·00	9·00	2·45	5	·85	½
	Aggregate				4·00	36·00	8·58	52	8·84	3
	Average per acre in 1913									

in 1913. Values as given on page 96 have been used:—

PLOUGHING AND SUBSOILING).

Expense in Raising Crop.									Particulars of Crop.						
Labour (including teamster).									Weight.						
Hours			Cost of horse labour	Cost of threshing.	Total cost.	Cost for one acre.	Cost for one bushel.	Cost for one ton.	Grain	Straw	Hay.	Fodder corn.	Total value.	Value of crop per acre	Profit or loss per acre.
2-horse team	3-horse team	4-horse team													
No.	No.	No.	$ c.	$ c.	$ c.	$ c.	cts.	$ c.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
29	1½	3½	12·56	.....	29·62	29·62	.....	2·46	.....	.....	.....	24,100	24·10	24·10	−5·52
1½	5¼	1¼	3·52	1·40	16·34	16·34	32	.....	1,750	1,290	.....	.....	20·08	20·08	3·74
2½	.....	.....	·98	.....	13·28	13·28	.....	6·99	.....	.....	3,800	.....	13·30	13·30	·02
2½	.....	.....	·99	.....	13·29	13·29	.....	6·96	.....	.....	3,820	.....	13·37	13·37	·08
35½	6¾	5	18·05	1·40	72·53	72·53	.....	.....	1,750	1,290	7,620	24,100	70·85	70·85	−1·68
...	.....	.....	.....	.....	18·13	18·13	.....	.....	.....	.....	.....	.....	17·71	17·71	−·42

(DEEP PLOUGHING).

12	9½	3	9·82	.....	27·22	27·22	...	1·98	.....	.....	.....	27,450	27·45	27·45	·23
1½	5¼	1½	3·52	1·34	16·28	16·28	·33	.....	1,678	1,262	.....	.....	19·30	19·30	3·02
2½	.....	.....	·98	.....	13·28	13·28	.....	6·87	.....	.....	3,870	.....	13·54	13·54	·26
2½	.....	.....	·99	.....	13·29	13·29	.....	7·11	.....	.....	3,740	.....	13·09	13·09	−·20
18½	14¾	4½	15·31	1·34	70·07	70·07	.....	.....	1,678	1,262	7,610	27,450	73·38	73·38	3·31
..				.....	17·52	17·52	.			...	.....	.....	18·34	18·34	·82

COMMERCIAL FERTILIZERS.

In 1913 there were completed five years of experiments designed to supply information concerning the relative fertilizing merits, in regular farm rotation, of:—

1. No manure or fertilizer of any kind, but pastured one year in four (records kept in 1913 only).
2. Barnyard manure.
3. Complete commercial fertilizer.
4. Barnyard manure, together with commercial fertilizer.

To carry out this work, four areas of land were selected, "N," in 1912, and "X," "Y" and "Z" in 1909. Each area was divided into four equal-sized plots, and placed under the following rotation:—

First year.—Hoed crop.

Second year.—Oats. Seeded down with 8 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre.

Third year.—Clover hay.

Fourth year.—Timothy hay on rotations "X," "Y" and "Z," and pasture on rotation "N." Land ploughed shallow in early autumn, top worked and ribbed up in late autumn.

FERTILIZER Treatment Given Rotations "N," "X," "Y" and "Z."

Crop.	Rotation N.	Rotation X.	Rotation Y.	Rotation Z.
Mangels.....	No fertilizer....	Manure 15 tons.	No manure.....	Manure, 7½ tons.
			Superphosphate, 300 lb....	Superphosphate, 150 lb.
			Muriate of potash, 75 lb...	Muriate of potash, 37½ lb.
			Nitrate of soda, 100 lb..	Nitrate of soda, 50 lb
Oats.....	No fertilizer....	No fertilizer....	Nitrate of soda, 100 lb..	Nitrate of soda, 100 lb.
Clover hay.....	No fertilizer....	No fertilizer....	Nitrate of soda, 100 lb..	Nitrate of soda, 100 lb.
Timothy hay...	Pastured.....	No fertilizer....	Nitrate of soda, 100 lb..	Nitrate of soda, 100 lb.

The five years' results for this experiment supply rather interesting data.

Rotation "X," which was fertilized with barnyard manure alone, cost the least to operate and produced the largest returns. The average profit per acre for the period was $7.88.

Rotation "Z," which received a mixture of barnyard manure and commercial fertilizers produced equally as well as rotation "X," but cost slightly more to operate with the result that the net profit was just $6.77 per acre.

Rotation "Y," receiving commercial fertilizer alone was the lowest in producing power and cost as much to operate as "X." The profits therefrom have averaged only $5.55 per acre.

These results show a distinct advantage of barnyard manure alone over commercial fertilizer alone for this soil, but point to the possibility of combining the two to good advantage when barnyard manure is scarce or high in price.

In calculating the returns from these rotations fixed values as given on page 96 of this report were used. Fertilizers were valued as follows:—

Muriate of potash	$2 50 per 100 pounds.
Nitrate of soda	3 00 "
Superphosphate	0 90 "

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COSTS, RETURNS AND PROFITS per Acre of Rotations "N," "X," "Y" and "Z."

Rotation.	Cost to operate.	Value of returns.	Net profit, 1913.	Net profit average of 5 years.
	$ cts.	$ cts.	$ cts.	$ cts.
N—No manure or fertilizer of any kind	11 92	13 05	1 13	*
X—Barnyard manure	16 47	22 09	5 62	7 88
Y—Complete commercial fertilizer	16 65	20 07	3 42	5 55
Z—Barnyard manure together with commercial fertilizer	17 81	21 16	3 35	6 77

*Average of one year only.

COSTS, RETURNS AND PROFITS per Acre of Rotations "X," "Y" and "Z," 1909-1913.

Year.	COST TO OPERATE PER ACRE.			VALUE OF RETURNS PER ACRE.			PROFIT PER ACRE.		
	X.	Y.	Z.	X.	Y.	Z.	X.	Y.	Z.
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
1909	13 15	15 42	14 51	19 72	20 70	20 82	6 57	5 28	6 31
1910	26 58	29 16	27 91	32 55	34 52	36 26	5 97	5 36	8 35
1911	14 86	16 70	16 16	24 90	22 84	26 88	10 04	6 14	10 72
1912	19 23	19 39	20 24	30 44	26 95	25 38	11 21	7 56	5 14
1913	16 47	16 65	17 81	22 09	20 07	21 16	5 62	3 42	3 35
Total for 5 years	90 29	97 32	96 63	129 70	125 08	130 50	39 41	27 76	33 87
Average per acre for 5 years	18 06	19 46	19 33	25 94	25 01	26 10	7 88	5 55	6 77

YIELDS of Hoed Crops on Rotations "X," "Y" and "Z," 1909-1913.

Year.	Area.	Rotation X.	Rotation Y.	Rotation Z.
	Acres.	Lb.	Lb.	Lb.
1909	1	26,540	28,290	26,445
1910	2	73,520	78,276	81,290
1911	1	28,160	22,730	29,970
1912	1	48,360	49,130	48,360
1913	1	36,000	32,480	34,418
Total yield 5 years		212,580	210,906	220,483
Average per acre for 5 years		17 tons 1,430 pounds.	17 tons 1,151 pounds.	18 tons 747 pounds.

YIELDS of Oats on Rotations "X," "Y" and "Z," 1909-1913.

Year.	Area.	Rotation X.		Rotation Y.		Rotation Z.	
		Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
	Acres.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
1909	1	1,455	2,725	1,615	2,735	1,576	2,789
1910*							
1911	1	1,474	2,436	1,709	2,530	1,893	2,777
1912	1	2,492	3,238	1,421	1,909	1,035	1,945
1913	1	1,650	1,680	1,457	1,363	1,565	1,735
Total yield 4 years		7,071	10,079	6,202	8,537	6,069	9,246
Average per acre for 4 years		52 bushels.	2,519 pounds.	45 bush. 20 lb.	2,134 pounds.	44 bush. 21 lb.	2,311 lb.

*Hoed crops grown in place of grain in 1910.

YIELDS of Hay on Rotations "X," "Y" and "Z," 1909-1913.

Year.	Area.	Rotation X.	Rotation Y.	Rotation Z
	Acres.	Lb.	Lb.	Lb.
1909	2	9,240	9,405	10,157
1910	2	6,900	7,230	7,860
1911	2	14,810	13,280	15,160
1912	2	12,000	11,610	11,120
1913	2	9,290	8,710	8,890
Total yield 5 years		52,240	50,235	53,187
Average per acre for 5 years		2 tons 1,224 pounds.	2 tons 1,023 pounds.	2 tons 1,318 pounds.

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FERTILIZER

Year of rotation.	Description of Soil.		Crops.		Area	Items of				
	Surface soil.	Subsoil.	Last Year	This Year.		Rev. manure.	Seed, wine and use of machinery.	Manual labour.		Horse
								Hours	Cost.	Single horse
			1912.	1913.	Acres.	$ c.	$ c.	No.	$ c.	No.
1st	Clay loam	Clay hardpan	Pasture	Mangels	·33	1 00	70	22	3 74	1¼
2nd	"	"	Mangels	Oats	·33	1 00	64	1	17	¼
3rd	"	"	Oats	Hay	·33	1 00	82	1¾	30	¼
4th	"	"	Hay	Pasture	·33	1 00	62			
	Aggregate				1·32	4 00	2 78	24¾	4 21	1¾
	Average per acre in 1913									

FERTILIZER

1st	Black muck	Clay hardpan	Hay	Mangels	1 00	6 75	2 10	68	11 56	4
2nd	Clay loam	"	Mangels	Oats	1·00	6 75	1 97	2¾	46	½
3rd	"	"	Oats	Hay	1·00	6 75	2 47	5	85	½
4th	"	"	Hay	Hay	1·00	6 75	2 47	4	68	½
	Aggregate				4·00	27 00	9 01	79¾	13 55	5½
	Average per acre in 1913									
	Average per acre for 5 years									

FERTILIZER

1st	Black muck	Clay hardpan	Hay	Mangels	1·00	7 14	2 10	69½	11 82	4
2nd	Clay loam	"	Mangels	Oats	1·00	7 14	1 97	4	72	½
3rd	"	"	Oats	Hay	1·00	7 14	2 47	6½	1 10	½
4th	"	"	Hay	Hay	1·00	7 14	2 47	5½	94	½
	Aggregate				4·00	28 56	9 01	85¼	14 58	5½
	Average per acre in 1913									
	Average per acre for 5 years									

FERTILIZER

1st	Black muck	Clay hardpan	Hay	Mangels	1·00	8 07	2 10	70	11 90	4
2nd	Clay loam	"	Mangels	Oats	1·00	8 07	1 97	2¼	46	½
3rd	"	"	Oats	Hay	1·00	8 07	2 47	6½	1 10	½
4th	Gravelly clay	"	Hay	Hay	1·00	8 07	2 47	5½	94	½
	Aggregate				4·00	32 28	9 01	84¼	14 40	5½
	Average per acre in 1913									
	Average per acre for 5 years									

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ROTATION "N."

Expense in Raising Crops.									Particulars of Crop.						
Labour (including teamster).									Weight.						
Hours.			Cost of horse labour	Cost of threshing.	Total cost.	Cost for one acre.	Cost for one bushel.	Cost for one ton.	Grain	Straw	Hay.	Mangels.	Total value.	Value of crop per acre.	Profit or loss per acre.
2-horse team.	3-horse team.	4-horse team.													
No.	No.	No.	$ c.	$ c.	$ c.	$ c.	cts.	$ c.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
5	1¼	1¼	3 15	.....	8 59	25 77	.....	1 97	.....	.....	.....	8,700	8 70	26 10	33
½	1¾	¼	1 07	28	3 16	9 48	30	.....	360	320	.....	.....	4 24	12 72	3 24
1	.....	.....	41	.....	2 53	7 59	.....	6 32	.....	.....	800	.....	2 80	8 40	81
.....	.....	.....	.....	.....	1 62	4 86	.....	.....	One	cow	fifty	days.	1 67	5 00	14
6½	3	1½	4 63	28	15 90	47 70	.....	.....	360	320	800	8,700	17 41	52 22	4 52
.....	.....	.....	.....	.....	.....	11 92	.....	.....	.....	.....	.....	.....	.....	13 05	1 13
ROTATION "X."															
14½	4	4	9 57	.....	29 98	29 98	.....	1 67	.....	.....	.....	36,000	36 00	36 00	6 02
1½	5¼	1	3 28	1 32	13 78	13 78	28	.....	1,650	1,680	.....	.....	19 86	19 86	6 08
3	.....	.....	1 15	.....	11 22	11 22	.....	3 96	.....	.....	5,660	.....	19 81	19 81	8 59
2½	.....	.....	99	.....	10 89	10 89	.....	6 19	.....	.....	3,630	.....	12 70	12 70	1 81
21½	9¼	5	14 99	1 32	65 87	65 87	.....	.....	1,650	1,680	9,290	36,000	88 37	88 37	22 50
.....	.....	.....	.....	.....	.....	16 47	.....	.....	.....	.....	.....	.....	.....	22 09	5 62
.....	.....	.....	.....	.....	.....	18 06	.....	.....	.....	.....	.....	.....	.....	25 94	7 88
ROTATION "Y."															
9½	4	4	7 87	.....	28 93	28 93	.....	1 78	.....	.....	.....	32,480	32 48	32 48	3 55
1½	5¼	1	3 28	1 16	14 27	14 27	33	.....	1,457	1,363	.....	.....	17 30	17 30	3 03
3	.....	.....	1 15	.....	11 86	11 86	.....	4 68	.....	.....	5,070	.....	17 75	17 75	5 89
2½	.....	.....	99	.....	11 54	11 54	.....	6 34	.....	.....	3,640	.....	12 74	12 74	1 20
16½	9¼	5	13 29	1 16	66 60	66 60	.....	.....	1,457	1,363	8,710	32,480	80 27	80 27	13 67
.....	.....	.....	.....	.....	.....	16 65	.....	.....	.....	.....	.....	.....	.....	20 07	3 42
.....	.....	.....	.....	.....	.....	19 46	.....	.....	.....	.....	.....	.....	.....	25 01	5 55
ROTATION "Z."															
12⅔	4	4	8 89	.....	30 96	30 96	.....	1 80	.....	.....	.....	34,418	34 42	34 42	3 46
1⅓	5¼	1	3 28	1 25	15 03	15 03	33	.....	1,565	1,735	.....	.....	19 12	19 12	4 09
3	.....	.....	1 15	.....	12 79	12 79	.....	4 84	.....	.....	5,280	.....	18 48	18 48	5 69
2½	.....	.....	99	.....	12 47	12 47	.....	6 91	.....	.....	3,610	.....	12 63	12 63	16
19½	9¼	5	14 31	1 25	71 25	71 25	.....	.....	1,565	1,735	8,830	34,418	84 65	84 65	13 40
.....	.....	.....	.....	.....	.....	17 81	.....	.....	.....	.....	.....	.....	.....	21 16	3 35
.....	.....	.....	.....	.....	.....	19 33	.....	.....	.....	.....	.....	.....	.....	26 10	6 77

EXPERIMENTAL STATION FOR PRINCE EDWARD ISLAND, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B. S. A.

CHARACTER OF SEASON.

The previous winter was severe, with snow on the ground for a very short period. The spring opened early in April with very warm weather. This was followed by a cool, dull May and June. July and August were seasonable. September was fine and the early harvest was well saved. October was extremely wet, with moist, warm weather throughout. Very little harvesting was done during the month, and it was not until the cold, dry winds of November that the late harvest was saved. Seeding was begun on May 13. Hoar frost occurred four times in June, though 35·5° F. was the lowest temperature recorded. The last frost occurred on the 15th, when the lowest temperature at the Station was 37° F. On July 17 haymaking commenced, and on August 21 the first grain was cut.

Some Weather Observations taken at Charlottetown Experimental Station, 1913.

Month.	Temperature F.			Precipitation.				Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	Heaviest in 24 hours.	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	24·17	50	-3	2·01	15·7	3·58	·33	82·6
February	13·46	48	-17·5	·34	21·8	2·52	·55	117·6
March	30·80	60	-4	3·21	14·	4·61	·64	131·
April	40·06	78¾	17·5	3·09	7·7	3·86	·78	148·8
May	45·07	68¼	28·5	2·9	1·	3·	1·1	195·6
June	56·06	73	33·5	1·27	....	1·27	·39	255·5
July	64·19	83·5	44	4·01	....	4·01	1·14	222·2
August	64·42	79·5	43	2·89	....	2·89	·79	251·2
September	56·13	75	39	3·98	....	3·98	·91	182·3
October	55·05	70	33	7·71	....	7·71	1·85	66·3
November	38·82	61	18	1·65	4·4	2·09	·7	101·6
December	27·64	56	7	2·11	16·5	3·76	·76	62·5
Total for year				35·17	81·1	43·28	-	1,817·2
Average for five years				33·15	101·	43·01		1,883·1
Total for six growing months, April to September				18·11	8·7	19·01		1,255·6
Average of five years for six growing months, April to September				17·79	7·9	18·58		1,292·3

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CROP YIELDS AND COST OF PRODUCTION OF FIELD CROPS.

The following data are compiled from the rotation experiments which were conducted on fields of 1 acre each. The area of this Station being small, we do not have an opportunity to grow crops on a large scale. The grain was grown for seed purposes. The land was not uniform in quality as explained elsewhere in this report and as the data are for one year only they should be considered as approximate only.

YIELDS AND COSTS OF PRODUCTION of Field Crops, Charlottetown, 1913.

Crop.	Area.	Yield per acre.		Cost to produce.		
				Per acre.	Per ton.	Per bushel.
	Acres.	Tons Lb.	Bush. Lb.	$ c.	$ c.	Cents.
Oats	1	.....	61 33	13 97	.....	15
Barley	1	.....	38 33	14 63	.....	18
Wheat	1	.....	19 38	11 95	.....	39·4
Turnips	1	26 545	875 45	41 78	1 59	4·9
Mangels	1	26 *1,635	893 55	42 35	1 58	4·75

ROTATION OF CROPS.

Six rotations were started in 1912 on the land lying along the east side of the P.E.I. railway, from the DeBlois road south. The land at the outset was very uneven. Buildings, brickyards and a large quantity of brick clay were removed. Cellars and ponds were drained and filled. The feature of these rotations during 1913 was the splendid crops of clover on all the fields of hay, from the aftermath of which seed was taken in the case of "D2," the others being equally good when they were ploughed under. The crops on these rotations were harvested in good condition, and, with the exception of wheat which was injured by the joint-worm and rust, the yields were good.

The following is a description of these rotations, and tables with details regarding the crops grown thereon this year:—

ROTATION "A" (FIVE YEARS' DURATION).

First year.—Hoed crop. Manured 25 tons per acre.

Second year.—Oats. Seeded down.

Third year.—Clover hay.

Fourth year.—Timothy hay or pasture

Fifth year.—Oats.

ROTATION "B" (FIVE YEARS' DURATION).

First year.—Hoed crop. Manured 25 tons per acre.

Second year.—Grain. Seeded down.

Third year.—Clover hay.

Fourth year.—Grain. Seeded down.

Fifth year.—Clover hay.

ROTATION "C" (FOUR YEARS' DURATION).

First year.—Hoed crop. Manured 20 tons per acre.

Second year.—Grain. Seeded down.

Third year.—Clover hay.

Fourth year.—Timothy hay or pasture.

ROTATION "D" (THREE YEARS' DURATION).

First year.—Hoed crop. Manured 15 tons per acre.

Second year.—Grain. Seeded down.

Third year.—Clover hay.

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ROTATION "F" (FOUR YEARS' DURATION).

First year.—Hoed crop. Manured 20 tons per acre.

Second year.—Grain. Seeded down.

Third year.—Clover hay.

Fourth year.—Grain. Seeded down.

ROTATION "G" (SEVEN YEARS' DURATION).

First year.—Grain.

Second year.—Hoed crop. Manured 30 tons per acre.

Third year.—Wheat or barley. Seeded down.

Fourth year.—Clover hay.

Fifth year.—Timothy hay.

Sixth year.—Pasture.

Seventh year.—Pasture.

Fixed values as given on page 96 of this report are being used.

ROTATION "A"

Rotation Year.	Crops.		Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours Manual labour	Manual labour. Cost of Manual labour	Horse labour (including teamster). Hours. Single horse	2-horseteam	3-horseteam	4 horseteam	5-horseteam
	1912.	1913.	Acres	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
2nd...	Turnips and corn	Oats	1	8 15	1 90	3	51		9·03			
3rd...	Oats	Hay	1	8 15	3 36	10·5	1 78		5·25			
4th...	Hay	Hay	1	8 15	3 36	8·5	1 44		3·75			
5th...	Hay	Barley	1	8 15	1 90	2·75	47		6·6	3·75		
1st...	Barley	Mangels	1	8 15	3 30	101·	17 17	27·25	7	9·75		
	Aggregate		5	40 75	13 82	125·75	21 37	27.25	31·63	13·50		
	Average per acre			8 15	2 76	25·15	4 27	5·45	6·32	2·70		

ROTATION "B"

2nd..	Corn	Wheat	1	5 86	1 84	2·75	47		6	2·25		
3rd..	Oats	Hay	1	5 86	5 01	4·50	76		4			
4th..	Mixed grain..	Oats	1	5 86	1 81	2·75	47		5·1	·75		
5th..	Barley	Hay	1	5 86	5 01	5·50	94		3·25			
1st.	Mixed grain..	Turnips	1	5 86	1 65	123·5	20 99	17·50	18·25	5·75		
	Aggregate		5	29 30	15 32	139	23 63	17·50	37·6	8·75		
	Average per acre			5 86	3 06	27·8	4·73	3·5	7·5	1·75		

ROTATION "C"

2nd...	Turnips	Oats	·57	4 96	1 06	1·33	23	·25	1·08	1·25		
3rd.	Oats	Hay	·57	4 96	1 91	2·75	47	·33	1·5			
4th...	Mixed grain....	Hay	·57	4 96	1 28	2·05	42	·33	1·25			
1st...	Mixed grain....	Corn and beans	·57	4 96	98	24·	4 08	5·	3·33			
	Aggregate		2·28	19 84	5 23	30·13	5 20	5·91	7·16	1·25		
	Average per acre			8 70	2 29	13·2	2 29	2·59	3·14	·55		

*Beans.

ROTATION "D"

2nd...	Mangels	Wheat	1	7 05	1 84	3	51		2·58	3		
3rd...	Wheat	Hay	1	7 05	5 01	7	1 19		4·33			
1st.	Mixed grain...	Potatoes	1	7 05	13 10	105½	17 89	15	12·83	1·75		
	Aggregate		3	21 15	19 95	115½	19 59	15	19·74	4·75		
	Average per acre			7 05	6 65	38·42	6 53	5	6·58	1·58		

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(five years' duration).

IN RAISING CROP.							PARTICULARS OF CROP.						
							Weight.						
Value of Horse labour	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of Stubble.	Grain.	Straw.	Hay.	Hoed Crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	c.	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
3 07	34	13 97	13 97	15	.....	8	2,107	2,333	.....	.....	25 73	25 73	11 76
1 78	.....	15 07	15 07	.....	.....	.....	.....	.....	5,335	.....	18 67	18 67	3 60
1 27	.....	14 22	14 22	.....	.....	.....	.....	.....	3,405	.....	11 92	11 92	−2 30
3 77	34	14 63	14 63	18	.....	6	1,857	3,873	.....	.....	26 32	26 32	11 69
13 74	.....	42 35	42 35	4.75	.....	.....	.....	.....	.....	53,635	53 63	53 63	11 28
23 63	68	100 24	.....	.....	.....	.....	.....	.....	.....	.....	136 27	.....	.....
4 72	14	.....	20 05	.....	.....	.....	.....	.....	.....	.....	.....	27 25	7 20

(five years' duration).

2 96	45	11 58	11 58	60	.....	.....	913	1,217	.....	.....	11 56	11 56	− 02
1 36	.....	12 99	12 99	.....	.....	.....	.....	.....	2,390	.....	8 36	8 36	−4 63
2 06	45	10 65	10 65	10·6	.....	.....	1,898	2,357	.....	.....	23 69	23 69	13 04
1 10	.....	12 91	12 91	.....	.....	.....	.....	.....	3,490	.....	12 21	12 21	− 70
13 28	.....	41 78	41 78	4·9	.....	.....	.....	.....	.....	52,545	52 54	52 54	10 76
20 76	90	89 91	.....	.....	.....	.....	.....	.....	.....	.....	108 36	.....	.....
4 15	18	.....	17 98	.....	.....	.....	.....	.....	.....	.....	.....	21 67	3 69

(four years' duration).

94	45	7 64	13 40	14·1	.....	.....	1,095	1,555	.....	.....	14 06	24 66	11 26
60	.....	7 94	13 93	.....	.....	.....	.....	.....	3,080	.....	10 78	18 91	4 98
52	.....	7 18	12 59	.....	.....	.....	.....	.....	1,680	.....	5 88	10 32	−2 27
2 48	.....	12 50	21 93	.....	.....	.....	*100	.....	.....	2,835	4 08	7 16	−14 77
4 54	45	35 26	.....	.....	.....	.....	.....	.....	.....	.....	34 80	.....	.....
1 99	20	.....	15 46	.....	.....	.....	.....	.....	.....	.....	.....	15 26	− 20

(three years' duration).

2 10	45	11 95	11 95	39·4	.....	.....	1,178	2,072	.....	.....	15 92	15 92	3 97
1 47	.....	14 72	14 72	.....	.....	.....	.....	.....	4,515	.....	15 80	15 80	1 08
9 12	*1 15	48 31	48 31	21·	.....	.....	.....	.....	.....	13,585	113 21	113 21	64 90
12 69	1 60	74 98	.....	.....	.....	.....	.....	.....	.....	.....	144 93	.....	.....
4 23	53	.....	24 99	.....	.....	.....	.....	.....	.....	.....	.....	48 31	23 32

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ROTATION "F"

Rotation Year.	Crops.		Area.	Items of Expense								
				Rent and manure.	Seed, twine and use of machinery.	Manual labour.		Horse labour (including teamster.) Hours.				
						Hours Manual labour.	Cost of Manual labour.	Single horse	2-horse team	3-horse team	4-horse team	5-horse team.
	1912.	1913.	Ac.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
2nd	Peas	Wheat	·86	7 84	1 62	2·75	47		2·83	4·75		
3rd	Oats	Hay	·86	7 84	4 41	4·5	77		3·58			
4th	Mixed grain	Barley	·86	7 84	1 59	2·5	42		11·83	3·25		
1st	Wheat	Turnips	·86	7 84	1 45	101·	17 17	19	14·5	4·75		
	Aggregate		3·44	31 36	9 07	110·75	18 83	19	32·74	12·75		
	Average per acre			9 11	2 64		5 47					

ROTATION "G"

2nd	Oats	Corn	·4	2 43	64	26¼	4 46	4	5			
3rd	Turnips	Oats	·4	2 43	76	1	17		2·58	1·		
4th	Wheat	Hay	·4	2 43	79	3	51		1·75			
5th	Mixed grain	Hay	·4	2 43	79	3	51		1·75			
6th	Mixed grain	Hay	·4	2 43	79	3	51		1·75			
7th	Mixed grain	Hay	·4	2 43	79	3	51		1·75			
1st	Mixed grain	Oats	·4	2 43	73	1·75	29		5·83	2·08		
	Aggregate		2·8	17 01	5 29	41	6 96	4	20·41	3·08		
	Average per acre			6 07	1 89	14	2 48	1·4	7·29	1·10		

(four years' duration).

IN RAISING CROP.							PARTICULARS OF CROP.						
							Weight.						
Value of Horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of Stubble.	Grain.	Straw.	Hay.	Hoed Crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
2 91	45	13 29	15 45	59	.....	.....	980	1,840	.....	.....	13 48	15 67	22
1 22	.....	14 24	16 56	40	.....	.....	.....	.....	1,270	.....	4 45	6 17	10 39
5 35	45	15 65	18 19	.....	.....	.....	1,339	2,301	.....	.....	17 99	20 92	2 73
12 01	.....	38 47	44 73	4·7	.....	.....	.....	.....	.....	48,505	48 50	56 39	11 66
21 49	90	81 65	.....	.....	.....	.....	.....	.....	.....	.....	84 42	.....	.....
6 25	26	.....	23 73	.....	.....	.....	.....	.....	.....	.....	.....	24 78	1 06

(seven years' duration).

2 78	.....	10 31	25 77	.....	.....	.....	.....	.....	.....	4,830	4 83	12 07	13 70
1 28	17	4 81	12 02	9·4	.....	.....	867	1,203	.....	.....	11 08	27 70	15 68
59	.....	4 32	10 80	.....	.....	.....	.....	.....	2,131	.....	7 45	18 62	7 82
59	.....	4 32	10 80	.....	.....	.....	.....	.....	1,613	.....	5 65	14 12	3 32
59	.....	4 32	10 80	.....	.....	.....	.....	.....	1,633	.....	5 72	14 30	3 50
59	.....	4 32	10 80	.....	.....	.....	.....	.....	1,693	.....	5 93	14 82	4 20
2 83	17	6 45	16 12	34	.....	.....	487	840	.....	.....	6 55	16 37	52
9 25	34	38 85	.....	.....	.....	.....	.....	.....	.....	.....	47 21	.....	.....
3 30	12	.....	13 87	.....	.....	.....	.....	.....	.....	.....	.....	16 86	2 99

BARNYARD MANURE—PLOUGHING DOWN *versus* TOP DRESSING FOR BARLEY.

One plot in rotation "F," with an area of .86 of an acre, had not received manure, so far as we could learn, for fifteen years. In the spring of 1913, 3 tons 1,800 pounds of barnyard manure were applied to the north half of the plot. The whole plot was then ploughed and worked similarly and seeded to Hannchen barley. After the grain came up, the south half received a top dressing of 3 tons 1,800 pounds of barnyard manure. During the summer the top-dressed portion of the field was at least one week behind the other, and at harvest it yielded 3 bushels 13 pounds less barley and 43 pounds less straw than the ploughed-under half. The difference in yield of barley per acre in favour of the manure being ploughed down was 7 bushels 29 pounds.

COUCH (TWITCH OR QUACK) GRASS.

A hay field that was badly infested with couch grass was ploughed August, 1912, and was rolled and cutaway-disc harrowed the following day. It was given a double cut with the disc harrow on August 14, 22, and 29, and on September 10, 12, and 27. It was worked deep and the couch cut in short pieces and buried. In the spring of 1913 the field was as green as ever with couch. It was then decided to resort to our old method of destroying this troublesome weed. The teeth of the spring-tooth harrow were set deep and the field was gone over twice on May 12, the smoothing harrow being used afterwards to shake out the roots. On May 14 the field was raked and several tons of couch roots per acre were removed. It was then ploughed 6 inches deep, spring-tooth harrowed twice, rolled and seeded.. The smoothing harrow was used again to shake out the couch roots that the other harrow had brought to the surface, and though the harrow was lifted continually the couch gathered into bunches so that it had to be spread by hand. When the couch on the surface was thoroughly dried out, the field was given a light top-dressing of manure. The couch which had been hauled off and completely killed was placed on top of the spreader loads and put back on the field. The field gave an average yield of 80 bushels of oats per acre, and appeared to be completely free of couch.

SOIL CULTURAL EXPERIMENTS.

Ten acres of the land next to the Abegweit Athletic Association grounds, and lying between the Prince Edward Island railway on the east and the Malpeque road on the west have been set aside for a comprehensive set of experiments in soil cultivation and renovation.

In Prince Edward Island some of the problems in respect to which the farmers are looking to the Experimental Stations for solution or for further information are:—

1. The improvement of neglected lands. These lands fall into two classes. (*a*) Whole farms that have been robbed of their fertility by excessive cropping with oats and timothy until natural grasses and weeds have possession. (*b*) The back fields on the majority of homesteads, which need improved rotations, better cultivation and more fertilizing.
2. The conservation and increase of soil fertility.
3. The control and eradication of weeds.
4. The conservation of soil moisture.

Some of the lines of experiment that are to be put under way are:—

Neglected land treatment.

Depth of ploughing.

After-harvest treatment of sod land in preparation for grain.

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After-harvest treatment of sod land in preparation for hoed crop.
Depth of seeding.
Seed bed preparation.
Applying barnyard manure.
Rates of seeding nurse crop of barley.
Rates of seeding nurse crop of oats.
Rates of seeding clover and timothy.
Underdraining.

DRAINAGE.

Thirty thousand feet of drain tile were purchased for the new areas and most of the area acquired from the Connolly Estate was tile drained. Forty acres of land in all were acquired by the Station in 1913 and two-thirds of it will be drained as soon as the tile can be laid. The land drained previously gave excellent results in 1913.

IMPROVEMENTS.

All the land newly acquired was fenced with a strong woven fence, and the posts painted. Dikes and rows of trees were levelled and removed. The fields were surveyed and roads opened.

EXPERIMENTAL FARM FOR NOVA SCOTIA, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

CHARACTER OF THE SEASON, 1913.

During the winter 1912-13 the snowfall was scanty, and no severe frost was registered during the latter part of the season. No snow fell after March 15, but 2 inches of rainfall, on March 27, caused considerable damage by washing the fields. Seeding commenced on May 6, but was retarded and germination was checked by the cold weather which prevailed throughout the month. In fact, growth was slow until July, when vegetation made remarkable progress. Due to the frequent rain throughout the growing season, the ripening of the harvest was slow. The early-sown grain was harvested in late August or early September but late-sown grain was not ripe until October, when the heavy rain damaged it to such an extent as to make it useless for seed and barely fit for feed.

SOME WEATHER OBSERVATIONS taken at Nappan Experimental Farm, 1913.

Month.	Temperature F.			Precipitation.			Total Sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	
	°	°	°	Inches.	Inches.	Inches.	Hours.
January	23·96	52	− 4	2·42	5·0	2·92	86·75
February	13·31	51	−15	·45	17·0	2·15	112·15
March	32·52	62	− 1	2·04	41·2	6·16	140·00
April	40 03	71	14	3·01	4·5	3·46	132·70
May	47·75	67	26	2·38	.....	2·38	169·15
June	54·56	74	31	1·97	.....	1·97	265·90
July	62·33	82	41	4·98	.....	4·98	226 05
August	61·00	80	33	3·76	.....	3·76	238·10
September	54·59	78	31	2·70	.....	2·70	165·95
October	55·28	72	28	7·85	.....	7·85	71·30
November	38·09	65	10	1·63	4·0	2·03	115·45
December	27·50	55	0	2·65	16·0	4·25	80·20
Total for year	.....			35·82	87·7	44·59	1803·70
Average for five years	.....			32·17	62·94	38·47	1925·50
Total for six growing months, April to September	.....			18·80	4·5	19·25	1197·85
Average of five years, for six growing months, April to Sept				17·63	3·3	18·16	1228·21

FIELD CROP YIELDS.

The yields of crops grown in field lots and under regular field conditions averaged as follows in 1913:

FIELD CROP YIELDS, Nappan, 1913.

Area.	Crop.	Yield per acre.			
Acres.		Tons.	Lb.	Bush.	Lb.
1	Mangels	19	685	644	45
10	Turnips	23	23	767	3
5	Corn	12	1,380	.....	
40	Marshland hay	1	1,856	.....	
24	Upland hay	2	856	.....	
2	Wheat	.....		29	30
3	Upland oats	.....		59	24
9	Marshland oats	.....		20	—
2	Barley	.....		33	44
¾	Potatoes	.....		376	—

YIELDS OF MANGELS.

Three varieties of mangels, considered the most suitable for this district, were grown in one-third acre plots on a clay loam soil.

YIELDS OF FIELD LOTS of Mangels, Nappan, 1913.

Area.	Name of variety.	Yield per acre.			
Acres.		Tons.	Lb.	Bush.	Lb.
⅓	Mammoth Long Red	18	120	602	
⅓	Yellow Intermediate	20	140	669	
⅓	Yellow Globe	19	1,795	663	15

COST OF PRODUCTION OF FIELD CROPS.

In calculating net profits from the rotations, some interesting figures have been obtained regarding the cost of producing the various crops grown. In explanation of the rather high cost in some cases it may be explained that in 1913 some of the fields did not yield quite up to the average production for previous years. Corn and turnips were the chief sufferers. The values used in computing these costs are given on page 96 of this report.

COST OF PRODUCTION of Field Crops, Nappan, 1913.

Crop.	Yield per acre.		Cost to produce.		
			Per acre.	Per ton.	Per bushel.
	Tons. Lb.	Bush. Lb.	$ cts.	$ cts.	cts.
Turnips	23 23	767 03	45 57	1 98	5·94
Mangels	19 685	644 45	49 51	2 56	7·68
Ensilage corn	12 1,380	.....	39 33	3 10	
Potatoes	.....	376 00	49 36	....	13·13
Oats	.....	59 24	17 25	....	28·9
Wheat	.....	29 30	14 42	....	48·9
Barley	.....	33 44	13 83	....	40·8

ROTATION OF CROPS.

There is perhaps no single practice in farm management of more importance than a systematic rotation of crops. It will help to maintain fertility, conserve soil moisture and control weeds and yet withal it is a feature of farm work to which, as a rule very little consideration is given.

So many different combinations of crops are possible, that a test of all that suggested themselves to us was quite impracticable. The following three, chosen because of the good results they have given in other sections of the country are now in operation.

ROTATION "B" (FIVE YEARS' DURATION).

First year.—Roots. Manured at rate of 25 tons per acre.

Second year.—Grain. Seeded down with 10 pounds red cover, 2 pounds alsike and 6 pounds timothy per acre.

Third year.—Clover hay. Ploughed in autumn.

Fourth year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 6 pounds timothy per acre.

Fifth year.—Clover hay.

ROTATION "C" (FOUR YEARS' DURATION).

First year.—Roots. Manured at rate of 20 tons per acre.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre.

Third year.—Clover hay.

Fourth year.—Pasture.

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Kentville, N.S.—Breaking-up teams and Manitoba Brush Breaking Plough.

ROTATION "D" (THREE YEARS' DURATION).

First year.—Roots. Manured at the rate of 15 tons per acre.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 6 pounds timothy per acre.

Third year.—Clover hay.

CROP HISTORY OF ROTATION LOTS.

Rotation "B" lot 1.—1905, no crop; 1906 and 1907 crop turned under; 1908 mixed grain, seeded down; 1909, hay; 1910, mixed grain, seeded down; 1911, roots, fertilized with 25 tons barnyard manure per acre, and 300 pounds mixed fertilizer per acre additional to every other half-acre plot; 1912, grain, seeded down. The soil is a whitish clay loam in fair heart. Is located on a steep slope. Surface drainage is good and lot is underdrained as well.

Rotation "B" lot 2.—1904, roots; 1905, grain, seeded down; 1906, clover hay; 1907, grain, seeded down; 1908, clover hay; 1909, roots; 1910, grain, seeded down; 1911, clover hay; 1912 roots. Lot has fair surface drainage and is partly underdrained. Soil is clay loam in fair heart.

Rotation "B" Lot 3.—Since 1905 lot 3 has received treatment similar to lot 2. No underdrainage has been done. Soil is clay loam, naturally wet and is not now in as good tilth as lot 2.

Rotation "B" Lot 4.—1908, pasture; 1909, no crop; 1910, one-half in pasture one-half in grain crop ploughed under, 400 pounds per acre of mixed fertilizer applied to every other half-acre plot; 1911 and 1912, green crop ploughed under; 1913, green crop of oats, peas and vetch turned under, 400 pounds per acre of mixed fertilizer applied to every other half-acre plot. The lot is in poor condition. Surface drainage is good, but it is naturally wet land. Soil is whitish clay loam.

Rotation "B" Lot 5.—1905 and 1906 pastured by sheep; 1907 and 1908, no crop; 1909, one-half in rape, one-half in buckwheat pastured very light; 1910, no crop; 1911, one-half of lot received 400 pounds mixed fertilizer per acre for green crop turned under, the remaining half was idle; 1912 the remaining half received 400 pounds mixed fertilizer per acre and green crop was ploughed under on entire lot; 1913, peas, oats, and vetch turned under. Soil varies from clay loam to sandy loam and is in poor heart. No underdrainage has been done and surface drainage is only fair.

Rotation "C" Lot 1.—1905, roots; 1906, grain, seeded down; 1907, clover hay; 1908, roots and corn; 1909, grain, seeded down; 1910, clover hay; 1911, pastured; 1912, roots; 1913, grain, seeded down. The soil is a clay loam underdrained and in good tilth, but infested with couch grass.

Rotation "C" Lot 2.—1907, grain, seeded down; 1908, clover hay; 1909, roots; 1910, grain, seeded down; 1911, clover hay; 1912, pastured; 1913, roots. Soil is clay loam underdrained and in good tilth.

Rotation "C" Lot 3.—1908, clover hay; 1909, grain; 1910, roots; 1911, grain, seeded down; 1912, clover hay; 1913, pasture. Soil is clay loam, underdrained and in good tilth.

Rotation "C" Lot 4.—1906, grain, seeded down; 1907, clover hay; 1908, roots; 1909, grain, seeded down; 1910, clover hay; 1911, roots; 1912, grain, seeded down; 1913, clover hay. Soil is whitish clay loam, underdrained and in good tilth.

NAPPAN.

Rotation "D" Lot 1, located immediately west of wood orchard.—1907, clover hay; 1908, grain, seeded down; 1909, clover hay; 1910, grain; 1911, roots; 1912, grain, seeded down; 1913, clover hay. Soil is a sandy clay loam, underdrained and in fair tilth.

Rotation "D" Lot 2, located across railroad and next to marsh land.—1906, roots and grain; 1907, grain; 1908 and 1909, hay; 1910, buckwheat; 1911, green crop turned under; 1912, roots; 1913, grain, seeded down. Soil is clay loam, well surface drained. Is very badly infested with couch grass.

Rotation "D" Lot 3.—1907, hay; 1908, roots; 1909, grain, seeded down; 1910, clover hay; 1911, grain, seeded down; 1912, clover hay; 1913, roots and corn. Soil is variable, part being a clay loam and part black muck. Is in fairly good tilth, but is infested with couch grass.

COMMERCIAL FERTILIZERS FOR TURNIPS.

Seven different varieties of turnips were sown in lots of 1 acre each. One-half acre of each variety was fertilized with barnyard manure alone applied at the rate of 20 tons per acre. The other half acre of each variety received barnyard manure at the rate of 20 tons per acre, and in addition 400 pounds per acre of a commercial fertilizer mixed in the following proportion: Superphosphate, 1½ pounds; bone meal, 1½ pounds; nitrate of soda, 1 pound; muriate of potash, 1 pound.

YIELDS OF TURNIPS with Manure alone and with Commercial Fertilizer in Addition to Manure.

Area	Variety.	Yield per acre with manure and comm'l fertilizers.	Yield per acre with manure alone.	Difference in yield in favour of addition of comm'l fertilizer.	Value of difference at 6c. per bushel.	Cost of fertilizer at $38.80 per ton.	Gain or loss from application of fertilizer in addition to regular quantity of manure.
Acres.		Bush. Lb.	Bush. Lb.	Bush. Lb.	$ cts.	$ cts.	$ cts.
½	Elephant	873 15	733 10	140 05	8 41	7 76	65
½	Jumbo	861 30	797 45	63 45	3 83	7 76	-3 93
½	Rennie's Prize	887 30	863 00	24 30	1 47	7 76	-6 29
½	Canadian Gem	760 30	725 30	35 00	2 10	7 76	-5 66
½	Magnum Bonum	1021 45	854 30	167 15	10 04	7 76	2 28
½	Sutton's Champion	342 30	307 15	35 15	2 12	7 76	-5 64
½	Jumbo	820 30	739 45	80 45	4 85	7 76	-2 91
½	Best of All	889 30	831 00	58 30	3 51	7 76	-4 25

Of the seven tests made, two only gave profits to compensate for the cost of the fertilizer. As these results accord closely with those obtained in previous years, it seems evident that turnips on our soil are not benefited to any extent by the use of the above commercial fertilizer in addition to the regular application of barnyard manure.

NAPPAN.

EXPERIMENTAL STATION FOR ANNAPOLIS AND CORNWALLIS VALLEYS, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT W. SAXBY BLAIR.

WEATHER CONDITIONS, 1913.

The early part of April was warm, the latter part cool. Land was fit for work on April 23. May was dull, with frequent light showers. Seeding and planting were done in good season. June was cool and unusually dry, and crops suffered from the drought. July continued cool with frequent showers. August was dry and crops were again checked for want of rain. September weather was favourable. October was wet, with a total rainfall of 9.60 inches, this being about 20 per cent more than the average. The temperature was unusually high, the average being 56·5°, which is 9° above the average for the twelve years previous. This condition was particularly favourable to roots, and as no frosts occurred on the corn area until October, this crop made good growth until cut, September 24 to 27.

Weather records have been taken since the month of April only, some of which are herewith reported.

SOME WEATHER OBSERVATIONS taken at Kentville Experimental Station, 1913.

Month.	Temperature F.			Precipitation.				Total Sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snow fall.	Total.	Heaviest in 24 hours.	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
April	41·9	77	19	4·29	.....	4·29	·70	137·1
May	46·2	70	27	3·17	.....	3·17	·84	178·2
June	56·7	78	33	1·23	.....	1·23	·54	270·1
July	65·4	87	44	3·72	.....	3·72	·88	252·1
August	63·3	86	36	1·70	.....	1·70	·55	258·4
September	54·3	84	35	2·55	.....	2·55	·85	156·6
October	56·5	74	31	9·60	.....	9·60	1·98	57·8
November	38·4	65	21	1·97	.....	1·97	·63	111·5
December	23·44	55	6	3·02	13·75	4·39	1·44	74·65
Total for six growing months April to September	.....	.....	.....	.....	.....	16·66	.....	1232·5

FIELD CROPS.

The field areas cultivated this season were principally those in orchards, the strips between the trees being devoted to various field crops. Some of the areas had been stumped the previous season and consequently were very uneven and difficult to work. Much time was necessarily spent during the spring months clearing these fields of stones and roots, and as a result the seeding of the crops was slightly delayed.

HAY.

Ten acres of dyked land were in hay. This produced about 18 tons of hay of fair quality.

CORN.

Ten acres of corn were planted. Part of it was seeded on May 26 on land fertilized with barnyard manure at the rate of 30 tons per acre. The manure was put into piles on the field during the winter and spread and ploughed under on May 13 to 15. A crop of buckwheat to be ploughed under had been grown the summer before, immediately following the removal of the stumps.

Three varieties of corn were sown in rows 3½ feet apart. The following yields were obtained:—

Longfellow,	11 tons	150 pounds per acre.
Compton's Early,	10 "	1,440 "
Canada Yellow,	8 "	1,440 "

Two acres of Longfellow, sown June 4, without stable manure, but fertilized with 400 pounds per acre of a complete fertilizer containing 4 per cent nitrogen, 8 per cent phosphoric acid, and 10 per cent potash, yielded only 4 tons 100 pounds per acre.

TURNIPS.

One and three-quarter acres of swede turnips were sown on May 19, the variety Lapland being used. The ground had been manured in the fall of 1912 with 20 tons of stable manure per acre. A crop of buckwheat had been ploughed in during the summer of 1912. This land was worked up and fertilized with 400 pounds per acre of a complete fertilizer. The turnips were sown in drills with a horse turnip seeder. The crop was harvested November 6 to 8, and yielded 628 bushels per acre.

Two acres of turnips were sown on land which had been stumped the previous summer and which had never before grown a crop. No stable manure was used, but a commercial fertilizer, containing 4 per cent nitrogen, 8 per cent phosphoric acid, and 10 per cent potash was applied at the rate of 800 pounds per acre. This was sown broadcast just before the ground was drilled for seeding. The variety Lapland was used. The yield was 565 bushels per acre.

OATS.

Ten acres of field oats, sown on newly-broken land, and fertilized with 200 pounds per acre of fertilizer containing 4 per cent nitrogen, 8 per cent phosphoric acid, and 10 per cent potash, yielded an average of 38.6 bushels per acre.

CLEARING LAND.

Seventeen acres of new land were cleared of stumps and ploughed during the season. Ten acres of the more easily cleared area cost as follows:—

Dynamite, 780 pounds (78 pounds per acre)	$140 40
Fuse and caps	18 60
Pulling out stumps	932 00
Dynamiting	143 00
Cleaning roots, piling and burning	213 50
Clearing up roots (second time over) and burning	183 00
Moving stones	172 00
Harrowing	35 00
Ploughing	350 00
Total cost for ten acres	$2,187 50
Cost per acre	218 75

KENTVILLE.

The remaining seven acres were much more difficult and cost $282.40 per acre.

Thirteen acres were brushed ready for stumping during the summer, at a cost of $21.15 per acre.

FENCING.

Eleven thousand three hundred and twenty feet of wire fences were erected on the east, north and west boundaries of the Station. Part of this was built through woods, which made the work very difficult. Owing to the great number of roots, and to the presence of sandstone and slate rock near the surface, holes for the posts had to be blasted in many cases. Cedar posts were used, and were set at a distance of 1 rod apart.

DYKING.

The dykes on the marsh area were badly out of repair, and in order to reclaim certain areas lying outside the old dykes, it was decided to construct new ones around the entire marsh. Eighty-five rods of dyke, 3½ feet high and with a 7-foot base, cost $2.50 per rod. Sixty-eight rods of dyke 4 feet high and with an 8-foot base cost $3 per rod. Five sluices were necessary to afford proper drainage. These were constructed of plank with a 5-inch by 7-inch opening, a metal sluice-gate being placed in each. The sluice-gates were of brass composition to prevent rusting from contact with salt water, and as a safe-guard against gnawing out by muskrats.

ROADS.

Work was commenced in the laying of a road through the ravine. The road leading to the ravine from the south end was graded and made passable. The sides of the ravine are very abrupt with sandstone near the surface which made it necessary to do considerable blasting. The field stones were used to form a foundation for the road where necessary.

EXPERIMENTAL STATION FOR NEW BRUNSWICK, FREDERICTON, N. B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

WEATHER CONDITIONS, 1913.

The winter of 1913 was much milder, with a lighter snowfall than is usual. The spring was comparatively cold and wet. Frosts were frequent in May and as late as June 23 a heavy frost was observed on the low-lying portion of the Station. The land here is naturally damp, which defers seeding, even in a dry season. This condition, coupled with the unseasonable weather this year, further retarded field operations. Even sod ploughing for grain could not be accomplished until June 1. The rains continued until July 15, after which the summer was dry with sufficient precipitation to stimulate rapid crop growth. The first frost was recorded on September 16; a second heavier one, on September 28, affected both corn and potatoes. During October there were 5.9 inches rainfall, which fell so continuously as to interfere seriously with harvesting operations. The grain and potato crops, as a result, were greatly damaged in the southern part of the province. On October 21 the next frost was noticed, and on October 31 there were 4 degrees of frost. During the month there were only three days of sunshine. November 1 and 2 registered 10 degrees and 17 degrees of frost respectively; the remainder of the month, however, was mild and bright, the rainfall amounting to only 1·2 inches.

SOME WEATHER OBSERVATIONS taken at Experimental Station, Fredericton, 1913.

Month.	Temperature F.			Total Precipitation.	Total Sunshine.
	Mean.	Highest.	Lowest.		
	°	°	°	Inches.	Hours.
January	22	51	−11	4·1	81
February	12	38	−20	2·9	123
March	30	60	−9	6·	124
April	42	83	15	2·2	160
May	47	83	27	4·	181
June	58	83	34	1·9	257
July	64	91	47	5·1	213
August	63	87	36	2·4	244
September	55	85	29	1·3	192
October	54	76	26	5·9	57
November	36	62	4	1·2	107
December	24	47	−13	1·2	112
Total for year				38·2	1,851
Total for six growing months, April to September				16·9	1,247

FIELD CROPS.

As little autumn preparation could be made the area under spring crops was limited. Thirteen acres of sod were ploughed for corn and one and one-seventh acres were ploughed for potatoes. One and one-sixth acres of buckwheat stubble were cultivated in preparation for garden vegetables.

OATS.

As the season was wet, all the oats sown were late. The first seeding was done on June 1. One and one-quarter acres of oats, grown on tile drained soil, gave a yield of 48 bushels of grain per acre. Seven acres of oats grown on rather wet land gave a yield of less than 22 bushels per acre. The advantages of underdrainage are clearly illustrated by both the increased yield and superior quality of the oats grown on the drained soil.

ENSILAGE CORN.

Twelve and one-half acres of tough couch sod were autumn ploughed and spring worked with disc harrow. Eighteen 35-bushel loads of horse manure were applied per acre and harrowed in. On June 5 and 6 four varieties of corn—Longfellow, Compton's Early, Leaming, White Cap Yellow Dent—were planted with a 2-row corn planter, provided with a fertilizer attachment, from which was distributed 468 pounds mixed fertilizer per acre. The fertilizer was made up as follows: 78 pounds nitrate of soda, 26 pounds sulphate of ammonia, 312 pounds acid phosphate, 52 pounds muriate of potash, and containing 3·6 per cent nitrogen, 10 per cent phosphoric acid, and 5·5 per cent potash.

The plants appeared above the ground on June 21 and were given thorough cultivation throughout the growing season. The crop was harvested on September 25, giving a yield of 115 tons for the 12½ acres. The resulting silage was of excellent quality.

TURNIPS.

Five acres that had produced a crop of oats the previous year, were prepared for turnips. The soil was sandy loam with clay subsoil. There were many stumps, large boulders and surface stones in all 500 loads of stone being removed. The stumps and larger boulders were blown up with dynamite.

Twenty loads of horse manure were applied and worked in with the disc, and in addition 400 pounds of basic slag and a mixed fertilizer made up of the following were applied: 70 pounds nitrate of soda, 70 pounds sulphate of ammonia, 100 pounds acid phosphate, 100 pounds bone meal, 120 pounds muriate of potash per acre.

The time required for clearing and preparing the land delayed the seeding until July 4 and 5. The seed was sown at the rate of 2 pounds per acre with a hand wheel seeder. The stand was rather thin, and, due to the dry weather, made slow growth. The crop was harvested on November 3, 4 and 5.

The following table records the varieties grown, their characteristics and yields:—

YIELDS OF TURNIPS, Fredericton, 1913.

Variety.	Description.	Yield per acre.	
		Tons.	Lb.
Invicta	Purple top swede, smooth and even	15	1,500
Laplund	Green " " pronged and uneven	14	35
Good Luck	Purple " " smooth, fairly even	19	400
Hedewicks Bronze top	Bronze " " smooth and even	16	175
Hall's Westbury	Purple " " small, smooth, even, and very shapely	14	800
Hartley's Bronze top	Bronze " " fairly smooth and even	18	1,350
Jumbo	Purple " " rather rough	17	80
Perfection	" " " large, even, fairly smooth	26	800
Bangholm	" " " fairly smooth and even	21	
Hazards Improved	Purple " " smooth and even	20	800
New Century	" " " large, fairly smooth, uneven	27	360

Average yield per acre: 670 bushels or 20 tons 200 pounds.

FENCING.

The fencing used is of number nine galvanized woven wire throughout, 48 inches high, nine strands, with uprights every 16½ inches. The wire is stapled to cedar posts placed one rod apart and from 3 to 4 feet in the ground. Both side lines and part of the road fences have been built, while posts have been set along some of the field fence lines, in readiness for the wire.

CLEARING LAND.

The first clearing operation was the burning of the brush and bushes left after the cut of the winter. In all, 150 acres were cleared and burned over. The larger stones were used in building a driveway over a ravine which crosses the land being cleared. Dynamite was used to break up the boulders into pieces that could be moved by a two-horse team. A powerful stumping machine was tried on green stumps, but this method of operation was found more expensive than the use of stumping powder and the removal of the shattered portions with a direct horse hitch. The stumps of the softer trees were readily removed by means of direct team hitch. About fifty acres were cleared in this way, and will be ready for crop in 1914.

EXPERIMENTAL STATION FOR EASTERN QUEBEC, STE. ANNE DE LA POCATIERE, QUEBEC.

REPORT OF THE SUPERINTENDENT, JOSEPH BEGIN.

WEATHER CONDITIONS, 1913.

The spring of 1913 opened favourably, and seeding was commenced in good time. Weather did not continue warm, however, through May and June, and all crops made slow growth. Corn, especially, suffered from the changeable temperature. July was cool and windy, with more rainfall than in June. Clovers had been badly winter killed, owing to the presence of ice on many of the fields, and hay yielded poorly. The early sown grain was harvested in September in good condition, but the late sown was not ripe till October, and had to be gathered under very unfavourable weather conditions.

SOME WEATHER OBSERVATIONS taken at Ste. Anne de la Pocatière Experimental Station, 1913.

Month.	TEMPERATURE F.			PRECIPITATION.			Total Sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	
	°	°	°	Inches.	Inches.	Inches.	Hours.
January	15·65	35	−25	2·05	20·	4·05	73·3
February	.....	12	.....	.....	24·	2·4	95·4
March	23·33	61	−4	1·47	30·	4·47	107·5
April	39·4	82·2	8·6	·12	6	·72	200·6
May	49·2	87·8	22·	2·69	.....	2·69	187·7
June	57·9	82·2	33·8	1·53	.....	1·53	241·5
July	63·4	83·2	44·	3·64	.....	3·64	226·8
August	62·4	81·2	39·2	1·34	.....	1·34	246·8
September	54·3	81·8	33·2	2·81	.....	2·81	199·8
October	47·5	75·4	24·2	3·42	.....	3·42	80·2
November	36·5	63·2	3·8	·77	.....	·77	89·9
December	17·2	32·2	−20·	·13	10	1·13	66·8
Total for year						28·97	1,816·3
Total for six growing months, April to September						12·73	1,303·2

CROP YIELDS.

There were no facilities this year for weighing the total crops as they came from the fields, but careful estimates were made in all cases, which we publish in order better to convey to our readers the degree of success attending our efforts to increase crop production by improved rotations and cultural methods.

Crop Yields (Approximate), Ste. Anne de la Pocatière, 1913.

Crop.	Area.	Yield per acre.			
	Acres.	Tons.	Lb.	Bush.	Lb.
Turnips, Magnum Bonum variety	1 33	23	1175	786	15
Corn, Longfellow variety	8 00	4			
Oats and peas, cut for hay	1 33	2	1000		
Oats, for grain	29 3			31	17

ROTATION OF CROPS.

Believing that much benefit would result if our farmers would adopt rotations that would eliminate the long continued growth of any one crop on the same land, it was decided to inaugurate a series of rotations, so that, by comparison the benefits of a well-arranged succession of crops could be shown. As yet three rotations only have been laid down, but more will be added as soon as land for the purpose is available. The three already under way are:—

ROTATION "A" (FIVE YEARS' DURATION).

First year.—Hoed crop of corn or roots. For corn, manure applied at rate of 25 tons per acre in spring and ploughed under. After crop is harvested land is shallow ploughed or cultivated.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre.

Third year.—Clover hay. Cut twice if possible.

Fourth year.—Timothy hay or pasture. Ploughed shallow in August, top worked and re-ploughed or ridged up in late autumn.

Fifth year.—Grain. Seeded down with 10 pounds red clover which is allowed to grow to be turned under following spring, when the hoed crop is corn.

ROTATION "C" (FOUR YEARS' DURATION).

First year.—Hoed crop of corn or roots.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre.

Third year.—Clover hay. Cut twice if possible.

Fourth year.—Timothy hay. Field ploughed shallow in August, top-worked and re-ploughed or ridged up in late autumn.

ROTATION "D" (THREE YEARS' DURATION).

First year.—Hoed crop of corn or roots. For corn, land is manured, 15 tons per acre, and ploughed in spring; for roots it is manured and ploughed in fall.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike 6 pounds alfalfa and 6 pounds timothy per acre.

Third year.—Clover hay. Cut twice if possible.

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DRAINAGE.

After the removal of the old fences, and the ploughing up of the old, unproductive sod land, underdrainage was the first improvement work that claimed our attention; 9,410 feet of tile were laid during the season on land intended to be planted to orchard and a beginning was made in the draining of the land to be used for general crop production.

In order to demonstrate to just what extent underdrainage is profitable, two four-year rotations were laid down, one of which will be thoroughly underdrained, while the other will be left undrained. Records of the cost per acre to operate, and the value of the products from each rotation will be kept, so that at some future time we shall be able to publish reliable data as to the length of time required for the drains to pay for the cost of their installation.

EXPERIMENTAL STATION FOR CENTRAL QUEBEC, CAP ROUGE, QUEBEC.

REPORT OF THE SUPERINTENDENT GUS. A. LANGELIER.

CHARACTER OF SEASON AND CROP NOTES, 1913.

For the farmer in the districts about Quebec, 1913 was a very good year. The spring was very early, grain seeding commencing at this Station on April 29. Haying began on July 9, but not until a couple of weeks later was the bulk of clover and timothy cut. Manchurian barley was the first field grain harvested, it being cut on August 6, and by the 30th of the same month practically all grain was in the stook. The first snowfall recorded was on November 26, when about 2 inches fell. Freezing up took place the following day.

As affecting the hay crop.—The mild winter of 1912-13 left bare many meadows and pastures, which were injured by frost. On the undrained, low areas, practically all the clover was killed and some of the grasses suffered. The crop of hay, however, with the splendid growing weather of June and early July, was a fair one in the district and averaged over two tons per acre at this Station.

As affecting the grain crop.—The spring of 1913 was one of the earliest in many years, some grain being sown the latter part of April. The thermometer went down to 25.2° F on May 15, and to 27.2° F on May 17, and no doubt this early-sown grain, which was only a few inches high at the time, was affected by these frosts. All grain sown from the 7th to the 15th of May made a splendid growth, there being just enough precipitation and heat at this period to give what was nearly a record crop in the district. Farmers who delayed sowing until the end of May saw their grain at a standstill during the drought which lasted throughout August, and harvested crops yielding much lower than they would have obtained had they been more diligent. The crop of oats was a very heavy one at this Station, averaging over 78 bushels per acre.

As affecting the corn crop.—Though early sown cereal grains were not greatly affected by the drought, Indian corn suffered severely. It is a heat-loving plant, but requires plenty of moisture to grow well, and the farmers who did not conserve moisture by cultivating often had a poor crop. During the night of September 14, frost nipped the corn and terminated its growth. Our yield here was about 25 per cent below the average.

As affecting roots.—The growth of roots was no doubt delayed by the drought of the latter part of summer, but the cool nights of September and October, coupled with a fair precipitation, gave them a renewal of vigour with the result that an average crop was harvested both here and throughout the district.

SOME WEATHER OBSERVATIONS taken at Cap Rouge Experimental Station, 1913.

	Temperature F.			Precipitation.				Total Sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	Heaviest. in 24 hours.	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	31·32	43·0	−22·2	0·24	4·5	6·96	0·83	47·8
February	4·80	41·0	−19·9	0·17	25·3	2·70	0·90	78·2
March	21·91	52·0	−14·9	2·80	23·0	5·10	0·71	67·5
April	39·35	83·0	15·2	2·14	1·2	2·26	0·83	199·8
May	48·95	85·0	25·2	3·27	.....	3·27	1·05	207·4
June	57·30	84·0	36·2	2·53	.....	2·53	0·68	233·7
July	65·19	88·0	45·2	5·36	.....	5·36	1·22	215·4
August	61·58	83·0	40·2	1·97	.....	1·97	0·58	230·7
September	56·60	82·0	28·2	4·01	.....	4·01	1·95	209·3
October	48·96	73·0	24·2	4·11	.....	4·11	0·81	76·3
November	33·42	61·0	13·2	1·75	2·6	2·01	0·88	61·1
December	21·23	37·0	−1·1	0·40	29·5	3·35	0·80	43·4
Total for year				28·75	86·1	40·28	.....	1670·6
Average for two years, 1912–13				35·47	132·7	45·67	.....	1603·0
Total for six growing months, May to October				.....	.....	21·25	.....	1172·8
Average of two years for six growing months, May to October				.....	.....	24·77	.....	1059·8

YIELDS OF FIELD CROPS.

The following statement of field crop areas and yields compares very favourably with that of 1912. The outstanding feature is the heavy crop of oats harvested, 10.89 acres averaging over 78 bushels per acre.

FIELD CROP AREAS AND YIELDS, Cap Rouge, 1913.

Crop.	Variety.	Acreage.	Total yield.	Yield per acre.
Corn	Longfellow	9·92	144,082 lb.	7 tons 524 lb.
Swedes	Good Luck	7·67	301,354 lb.	654 bush. 50 lb.
Carrots	White Belgian	1·52	40,583 lb.	444 bush. 59 lb.
Oats	Banner	10·89	28,955 lb.	78 bush. 7 lb.
Hay	Timothy and Clover	37·13	153,904 lb.	2 tons 145 lb.

COST OF PRODUCTION OF FIELD CROPS.

The exact cost of production was recorded for swede turnips, oats and hay. Details of this work are as follows:—

COST OF PRODUCTION OF SWEDE TURNIPS.

The figures herewith given are for 1 acre of turnips grown in a three-year rotation of turnips, grain, clover hay. The soil was a dry sandy loam, not unlike the soil of many farms in this district. The subsoil was shale.

Rent of land at $3 per acre	$3 00
Share of manure, at rate of 12 tons per acre, at $1 per ton	4 00
Use of machinery at 60 cents per acre	0 60
Seed, 5 pounds at 23 cents per pound	1 15
Ploughing in autumn, 9 hours 2-horse team at 34 cents	3 06
Discing in spring, 6 hours 3-horse team at 41 cents	2 46
Harrowing, 1 hour 2-horse team at 34 cents	0 34
Rolling twice, 1½ hours 1-horse team at 27 cents	0 41
Ridging, 5 hours 2-horse team at 34 cents	1 70
Sowing, 2 hours 1-horse team at 27 cents	0 54
Singling and hoeing, 37 hours manual labour at 17 cents	6 29
Cultivating, 5 hours 1-horse team, at 27 cents	1 35
Cultivating, 5 hours 2-horse team at 34 cents	1 70
Pulling, topping, loading, 30 hours manual labour at 17 cents	5 10
Hauling, 15 hours 1-horse team at 27 cents	4 05
Storing, 15 hours manual labour at 17 cents	2 55
Cost per acre	$38 30

Yield of roots per acre, 19 tons 1,454 pounds or 657 bushels 34 pounds.
Cost to produce 1 ton, $1.94.
Cost to produce 1 bushel, 5·82 cents.

COST OF PRODUCTION OF OATS.

One acre of Banner oats was grown on a light, sandy loam with shale subsoil. The land was in pasture from 1902 to 1907, in oats 1908, in hay 1909, in pasture 1910, in corn 1911, and in swedes 1912.

Rent of land at $3 per acre	$3 00
Share of manure, at rate of 20 tons per acre, at $1 per ton	4 00
Use of machinery at 60 cents per acre	0 60
Seed, 2½ bushels	1 00
Twine, 2½ pounds at 8·3 cents per pound	0 21
Ploughing in autumn, 9 hours 2-horse team at 34 cents	3 06
Discing in spring, 6 hours 3-horse team at 41 cents	2 46
Harrowing, 1 hour 2-horse team at 34 cents	0 34
Rolling, 1 hour 1-horse team at 27 cents	0 27
Sowing, 1 hour 2-horse team at 34 cents	0 34
Cutting with binder, 1 hour 2-horse team at 34 cents	0 34
Stooking, 6 hours manual labour at 17 cents	1 02
Loading and unloading, 11 hours manual labour at 17 cents	1 87
Hauling, 2 hours 2-horse team at 34 cents	0 68
Storing, 2 hours manual labour at 17 cents	0 34
Threshing, 6·3 cents per bushel of 34 pounds	3 82
Cost per acre	$23 35

Yield of grain per acre, 2,060 pounds or 60 bushels 20 pounds.
Yield of straw per acre 2,360 pounds or 1 ton 360 pounds.
Valuing the grain at 1 cent per pound, the cost to produce 1 ton of straw was $3.68.
Valuing the straw at $4 per ton, the cost to produce 1 bushel of grain was 31·4 cents.

CAP ROUGE.

COST OF PRODUCTION OF HAY.

The following figures are for 1 acre of clover grown in a four-year rotation of roots, grain, clover hay, timothy hay. The soil was a rather light, clay loam underlaid with shale at a depth varying from 12 to 18 inches.

Rent of land, at $3 per acre	$3 00
Share of manure, at rate of 16 tons per acre at $1 per ton	4 00
Use of machinery, at 60 cents per acre	0 60
Half of the charges on 12 pounds timothy at 8½ cents, 8 pounds red clover at 27 cents, and 2 pounds alsike at 31 cents	1 90
Cutting, ½ hour with 2-horse team at 34 cents	0 17
Tedding, 1 hour with 2-horse team at 34 cents	0 34
Side delivery raking, ½ hour with 2-horse team at 34 cents	0 17
Raking, after loader, ½ hour with 1-horse team at 27 cents	0 14
Loading, 1½ hours with 2-horse team, at 34 cents, and 3 hours manual labour at 17 cents	1 02
Unloading, 1½ hour with 2-horse team, at 34 cents, and 3 hours manual labour at 17 cents	1 02
Cost per acre	$12 36

Yield of hay per acre, 3 tons 410 pounds.
Cost to produce 1 ton $3.86.

As the cost of production per unit depends very much on the yield, it should be noted that in this case the crop of clover was an exceptionally large one, the crop of oats more than the average, and the crop of swedes rather low. No doubt the tillage necessary to grow a crop of roots has a lasting effect, and a portion of the horse and manual labour charged to the root crop should perhaps go to the debit of the grain and the hay which follow it. Another point to be taken into consideration, is the favourable effect of succulent feeds, such as swedes, on the digestive tract of farm animals, allowing them to make a better use of dry roughages such as hay. With all this in mind, the wise farmer will do well to continue growing roots or other succulent feeds even though the cost of production is high as compared with hay. In fact, it is certain that the latter could not be produced so cheaply were it not for the beneficial effects derived from the hoed crop which preceded it.

ROTATION OF CROPS.

The rotations suitable for this district should, as a rule, include one hoed crop, one or two cereal crops (not grown in succession) and from one to four crops of hay or pasture. The following four rotations are under test at this Station:—

ROTATION "D" (THREE YEARS' DURATION).

First year.—Corn or roots.
Second year.—Grain. Seed down with 8 pounds red clover, 2 pounds alsike, and 8 pounds timothy per acre.
Third year.—Clover hay. Two crops when weather conditions permit.

This rotation is suited to high-priced and easily-tilled land where large crops must be secured to meet heavy rents and overhead charges. It presupposes either a sufficient area of untillable land to be used for pasture, or yard feeding.

Shortly after the second crop of hay is harvested the land is ploughed 4 inches deep, and as flat as possible to ensure a quick rotting of the turf. It is then rolled and the area is cultivated often during the autumn to kill weeds and conserve moisture. Late in the autumn a second ploughing is given, about 5 or 6 inches deep, a more upright furrow being turned this time, in order to leave a larger

surface on which the frost may work during the winter. Manure is applied the following spring, and the turnips sown in drills 30 inches apart, and the corn in rows 42 inches apart. After the turnips or corn is harvested the land is ploughed and left as rough as possible, it having been found here that if only disced, it is liable to pack with the snow to such a degree that ploughing might again be required in the spring. The grain is sown as soon as possible after the ground can be worked.

ROTATION "C" (FOUR YEARS' DURATION).

First year.—Corn or roots.

Second year.—Grain. Seed down with 8 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre.

Third year.—Clover hay. Two crops when weather conditions permit.

Fourth year.—Timothy hay or pasture.

This is a very intensive rotation, especially where stock has to be pastured on the area under cultivation. As a part of the fourth year crop may be left to grow timothy for horses, and the remainder pastured off, it is a very good rotation for the general farmer. The aftermath of the third year crop may be pastured, or cut as a soiling crop if it is desired to add to the stock carrying capacity of the land. In either case, it is good policy to allow the grass to make a certain growth before freezing sets in, as the protection afforded is likely to affect favourably the meadow or pasture the following year.

The preparatory treatment for roots or corn is similar to that given in rotation "D." In case it is deemed advisable to leave the stock on the land until late, one ploughing only, with a fairly upright furrow, is made in the autumn, the ground being rolled as early as possible in the spring, then cross-ploughed in preparation for swedes or corn.

ROTATION "B" (FIVE YEARS' DURATION).

This rotation has been under test for one year only. The crops rotate in the following order:—

First year.—Corn or roots.

Second year.—Grain. Seed down with 8 pounds red clover, 2 pounds alsike and 8 pounds timothy per acre.

Third year.—Clover hay. Two crops when weather conditions permit.

Fourth year.—Grain. Seed down with 8 pounds red clover, 2 pounds alsike and 8 pounds timothy per acre.

Fifth year.—Clover hay. Two crops when weather conditions permit.

This is a very good rotation for the dairyman who has to pay high prices for mill feeds and bedding, as it gives a large proportion of grain and straw. By using one entire lot of clover and the aftermath of the other for soiling, quite a large number of stock can be carried.

In preparing for hoed crops, the clover sod is treated as in rotation "D."

ROTATION "K" (SIX YEARS' DURATION).

First year.—Corn or roots.

Second year.—Grain. Seed down with 8 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre.

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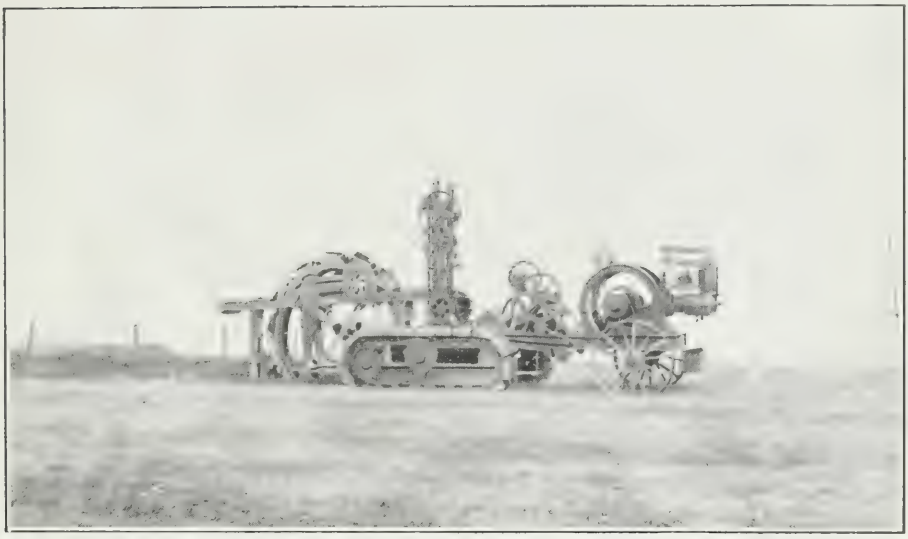

Ditching Machine, Cap Rouge, Que.

Ditching Machine, Cap Rouge, Que.

Third year.—Clover hay.

Fourth year.—Timothy hay.

Fifth year.—Pasture.

Sixth year.—Pasture.

This rotation would be found useful where manual labour is so scarce as to preclude the adoption of a shorter one, better calculated to produce maximum crops, control weeds and maintain soil fertility. It may well be recommended to farmers who follow no particular rotation and who are desirous of changing gradually to a more productive system of farming.

The land for hoed crops would be prepared as in rotation "D."

The following tables contain details in connection with the above four rotations. Values as given on page 96 have been used in calculating results:—

ROTATION "D" (Three Years' Duration)

Rotation Year.	Lot.	Crops. 1912.	Crops. 1913.	Area.	Items of Expense in Raising: Rent and Manure.	Seed, Twine and Use of Machinery.	Manual labour. Hours Manual Labour.	Manual labour. Cost of Manual Labour	Horse labour (including teamster) Hours. Single Horse.	2-Horse Team	3-Horse Team
				Acres.	$ c.	$ c.	No.	$ c.	No.	No.	No.
1st.	North Gaudreau 1	Potatoes	Oats	1	7 00	1 85	20	3 40	2	14	6
2nd	" 2	Oats	Hay	1	7 00	4 74	3	51	·5	4	
3rd.	" 3	Hay	Swede	1	7 00	1 75	82	13 94	23·5	20	6
	Aggregate				21 00	8 34	105	17 85	26	38	12
	Average per acre			3	7 00	2 78	35	5 95	8·66	12·66	4

ROTATION "C" (Four Years' Duration)

1st	North Gaudreau 1	Hay	Swedes	1	7 00	1 75	78	13 26	20·5	32	5
2nd	" 2	Swedes	Oats	1	7 00	1 85	18	3 06	1	14	6
3rd	" 3	Oats	Hay	1	7 00	2 50	6	1 02	·5	5	
4th	" 4	Hay	Hay	1	7 00	2 50	2	34	·5	2	
	Aggregate			4	28 00	8 60	104	17 68	22·5	53	11
	Average per acre				7 00	2 15	26	4 42	5·62	13·25	2·75

ROTATION "B" (Five Years' Duration)

1th	South Gaudreau 1	Oats	Oats	1	7 00	1 77	14·5	2 47	1	14	6
2th	" 2	Oats	Hay	1	7 00	4 74	2	34	·5	2	
3rd	" 3	Oats	Swedes	1	7 00	1 75	65	11 05	18·5	32	5
5rd	" 4	Swede	Oats	1	7 00	1 81	19	3 23	1	14	6
4rd	" 5	Oats	Hay	1	7 00	4 74	2	34	·5	2	
	Aggregate			5	35 00	14 81	102·5	17 43	21·5	64	17
	Average per acre				7 00	2 96	20·5	3 49	4·3	12·8	3·4

ROTATION "K" (Six Years' Duration)

5th	Big Trudel 1	Hay	Hay	1	7 00	1 55	4	68	·5	6·5	
6th	" 2	Hay	Hay	1	7 00	1 55	4	68	·5	6·5	
1st	" 3	Hay	Swede	1	7 00	1 75	65	11 05	18	34·5	5
2nd	" 4	Swede	Oats	1	7 00	1 87	23	3 91	2	14·5	6
3rd	" 5	Oats	Hay	1	7 00	1 55	6	1 02	·5	9·5	
4th	" 6	Hay	Hay	1	7 00	1 55	4	68	·5	6·5	
	Aggregate			6	42 00	9 82	106	18 02	22	78	11
	Average per acre				7 00	1 64	17 66	3 00	3·66	13	1·83

Hoed Crop—Grain—Hay.

Crop.					Particulars of Crop.						
					Weight.						
Value of Horse labour.	Cost of Threshing.	Total Cost.	Cost for 1 acre.	Cost for 1 Bushel.	Grain.	Straw.	Hay.	Roots.	Total Value.	Value of Crop per Acre.	Profit or Loss per Acre.
$ c.	$ c.	$ c.	$ c.	Cents.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
7 76	4 73	24 74	24 74	32·90	2,557	2,888	.....	.....	31 35	31 35	6 61
1 50	.....	13 75	13 75	.....	.....	.....	3,820	.....	13 37	13 37	— 38
15 61	.....	38 30	38 30	5·82	.....	.....	.....	39,454	39 45	39 45	1 15
24 87	4 73	62 79	62 79	.....	2,557	2,888	3,820	39,454	84 17	84 17	7 38
8 29	1 58	20 93	20 93	.....	852	963	1,273	13,151	28 06	28 06	2 46

Hoed Crop—Grain—Hay—Hay or Pasture.

18 47	.....	40 48	40 48	6·29	.....	.....	.....	38,586	38 59	38 59	−1 89
7 49	3 59	22 99	22 99	40·40	1,935	3,105	.....	.....	25 56	25 56	2 57
1 84	.....	12 36	12 36	.....	.....	.....	6,410	.....	22 44	22 44	10 08
78	.....	10 62	10 62	.....	.....	.....	1,700	.....	5 95	5 95	−4 67
28 58	3 59	86 45	86 45	.....	1,935	3,105	8,110	38 586	92 54	92 54	6 09
7 15	90	21 61	21 61	.....	484	776	2,028	9,647	23 14	23 14	1 52

Hoed Crop—Grain—Hay—Grain—Hay.

7 49	3 07	21 80	21 80	44·76	1,656	1,874	.....	.....	20 31	20 31	−1 94
82	.....	12 90	12 90	.....	.....	.....	2,950	.....	10 33	10 33	−2 57
17 93	.....	37 73	37 73	6·86	.....	.....	.....	32,997	33 00	33 00	−4 73
7 49	3 82	23 35	23 35	38·54	2,060	2,360	.....	.....	25 32	25 32	1 97
82	.....	12 90	12 90	.....	.....	.....	3,140	.....	10 93	10 99	−1 91
34 55	6 89	108 68	108 68	.....	3,716	4,234	6,090	32,997	99 95	99 95	−8 73
6 91	1 38	21 74	21 74	.....	743	847	1,213	6,599	19 99	19 99	−1 75

Hoed Crop—Grain Hay— Hay—Hay or Pasture—Hay or Pasture.

2 35	.....	11 58	11 58	.....	.....	.....	4,195	.....	14 68	14 68	3 10
2 35	.....	11 58	11 58	.....	.....	.....	3,775	.....	13 21	13 21	1 63
18 64	.....	38 44	38 44	6·38	.....	.....	.....	36,159	36 16	36 16	−2 28
7 87	4 95	25 60	25 60	32·60	2,670	3,400	.....	.....	33 50	33 50	7 90
3 37	.....	12 94	12 94	.....	.....	.....	6,435	.....	22 52	22 52	9 58
2 35	.....	11 58	11 58	.....	.....	.....	4,275	.....	14 96	14 96	3 38
36 93	.....	111 72	111 72	.....	2,670	3,400	18,680	36,159	135 03	135 03	23 31
6 16	.....	18 62	18 62	.....	445	56	3,113	6,027	22 51	22 51	3 89

Cap Rouge.

The work done with these rotations, to date, has not given the results which might have been expected, as the long rotation has given the greatest profit. The figures are, nevertheless, interesting. It must be understood that for the three and four year rotations, the season of 1911 was of a preparatory nature, and that 1912 was one of the worst years for spring work in the past quarter-century. It was therefore to be expected that the six-year rotation, with its four years in hay, would forge ahead. Then again, the piece of land where is located rotation "K" had been under a good four-year rotation for eight years, whereas the area where are the two others, was an old pasture in rather poor condition.

COSTS, RETURNS AND LOSSES of Rotations "D," "C," and "K," average of 3 years.

Rotation.	Cost to operate per acre.	Value of returns per acre.	Loss per acre.
	$ cts.	$ cts.	$ cts.
"D" (three years' duration)	23 96	18 19	5 77
"C" (four years' duration)	20 10	14 60	5 50
"K" (six years' duration)	17 88	16 42	1 46

The above figures, showing a loss throughout, do not at first sight appear encouraging. That all these rotations are rapidly improving and will soon show a handsome profit seems apparent, however, when the following table is examined:—

INCREASE IN VALUE of Products of Rotations "D," "C," and "K," in 3 years.

Items.	Rotation. D.	Rotation. C.	Rotation. K.
	$ cts.	$ cts.	$ cts.
Value of products per acre, 1913	28 06	23 14	22 51
" " " 1911	16 80	12 67	15 58
Increase in value of products from 1911 to 1913	11 26	10 47	6 93
Per cent increase in value of products from 1911 to 1913	0 67	0 83	0 44

RATES OF SEEDING.

Experiments have been undertaken to find the best rates of seeding corn for silage, oats, timothy and clover, and the effect on the yield of hay of different rates of seeding oats. As these experiments have not been long under way, however, the results may not yet be taken as conclusive.

RATES OF SEEDING CORN FOR SILAGE.

As in 1911 and 1912, Longfellow corn was sown at different spaces both in rows and in hills. The following table gives the yields in 1913, and the average yields for three years:—

CAP ROUGE.

PLANTING CORN in Hills *versus* Drills.

Method of planting.	Yield per acre 1913.	Yield per acre average of 3 years.
In rows 42 inches apart, plants 8 inches apart in row	10 tons 122 lb.	9 tons 1,094 lb.
In rows 48 inches apart, plants 8 inches apart in row	9 " 265 "	8 " 1,754 "
In hills 36 inches apart, every direction	5 " 167 "	5 " 1,398 "
In hills 42 inches apart, every direction	4 " 574 "	5 " 1,364 "

According to the above figures, which, it must be understood, are the result of only three years' work, it would appear that more weight can be had by sowing corn in rows than by having it in hills. Where land is dirty it would perhaps be advisable to sow in hills because of the greater ease of cultivation.

RATES OF SEEDING OATS.

To determine the best quantity of seed to use, oats are being sown at thirteen different rates varying from 1 to 4 bushels per acre. The test has been conducted one year only, and as no regular gradation in yield was shown, the results, as yet, suggest little of value. In our field operations, 2½ bushels per acre is the amount used. The following table shows in detail the results of this experiment 1913:—

RATES OF SEEDING OATS.

Rate of seeding per acre, Bushels	1	1¼	1½	1¾	2	2¼	2½	2¾	3	3¼	3½	3¾	4
Yield per acre, Bushels	60·9	59·6	63·9	73	58	56·7	65·3	58	64·2	71·7	53·8	67·3	68·8

RATES OF SEEDING CLOVER AND TIMOTHY.

To determine whether the liberal use of clover and timothy seed has any effect on the yield of hay, twenty-two plots were sown to oats in the spring of 1912, on eleven of which 6 pounds timothy, 4 pounds red clover and 1 pound alsike were used per acre, whilst on the other eleven, twice this quantity was seeded. The full seeding yielded at the rate of 3,447 pounds per acre, whilst the half seeding gave only 2,989 pounds. The difference in favour of the heavy seeding was 458 pounds per acre, an increase of 15 per cent.

EFFECT ON YIELD OF HAY OF QUANTITY OF GRAIN SOWN AS A NURSE CROP.

This experiment was carried out in duplicate, with one-sixtieth acre plots, using a nurse crop of oats varying in quantity from 1 to 3½ bushels per acre. One year's results do not supply sufficient data upon which to base a conclusion, but it may be pointed out that the group of consecutive seedings which gave the most oats produced the least hay afterwards, and vice versa. This is a very important question in a district where, after a crop of grain, the land is often in hay for five or six years, and then pastured for two or three more. The following figures give details:—

CAP ROUGE.

Effect on Yield of Hay of Quantity of Grain sown as a Nurse Crop.

Rate of seeding oats per acre, 1912, Bushels	1	1¼	1½	1¾	2	2¼	2½	2¾	3	3¼	3½
Yield of oats per acre, 1912, Bushels	69·9	59·6	63·9	73	58	56·7	65·3	58	64·2	71·7	53·8
Yield of hay per acre, 1913, Pounds	2,550	2,550	3,360	3,900	3,960	3,720	3,620	3,150	3,120	3,000	2,160

When the above are divided into groups of light, medium and heavy seedings the yields average as follows:—

Effect on Yield of Hay of Quantity of Grain sown as a Nurse Crop.

Rate of seeding oats per acre, 1912, Bushels	1 to 1¾	2 to 2¾	3 to 3½
Average yield of oats per acre, 1912, Bushels	64·3	59·5	63·2
Average yield of hay per acre, 1913, Pounds	3,090	3,615	2,860

YIELDS OF HAY WITH DIFFERENT KINDS OF NURSE CROP.

In 1912, all trial plots of cereals were seeded down with clovers and grass at the rate of 12 pounds timothy, 8 pounds red clover and 2 pounds alsike per acre, to determine with what kind of grain a good hay crop could best be secured. The following table shows the details of this experiment:—

Yields of Hay with Different Kinds of Nurse Crop.

Nurse crop.	Number of tests.	Yield of hay per acre 1913
Barley	13	4,740 lb.
Wheat	14	4,320 "
Oats	12	3,660 "

It will be seen that the crop of hay was 30 per cent larger with barley than with oats, and 18 per cent larger with wheat than with oats.

DRAINAGE.

During 1913, 1,020 six-inch, 1,420 five-inch, 1,610 four-inch and 22,654 three-inch tiles were laid. A 15-horsepower gasoline traction ditcher was used for most of the excavating. Though the grade in many cases was very slight, and the ground uneven, the work of the ditcher was very satisfactory.

A number of two-inch tile laid by a previous owner were examined and found to be clogged. Though they were, theoretically, large enough to carry away all the water, a very slight bulge or misplacement was sufficient to put them out of working order. Nothing smaller than three-inch tile is now being laid here, or recommended for the general use of farmers.

CLEARING LAND.

About 20 acres of land were cleared and ploughed during the season of 1913. The large stumps were dynamited. For the small ones, a double block and tackle was used, which is much superior to the chain attached from stump to whiffletree direct. Another time saver is what is called a double grub hook. With one good horse many roots which could not be taken hold of by a chain were easily handled by this method.

Cap Rouge.

EXPERIMENTAL FARM FOR MANITOBA, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

WEATHER CONDITIONS AND CROP NOTES, 1913.

The season of 1913 opened up with a very rapid disappearance of snow. Winter weather had continued to the end of March, but once warm weather began, spring came on apace. Work on the land commenced on the Experimental Farm on April 14, and the first seeding was made on April 16. On the higher part of the Farm, conditions for work were ideal, and seeding was finished early, but the lower lands were flooded by an overflow of the Assiniboine river. The river rose about May 1 and covered about 200 acres of the Farm, some of which had been seeded. The water remained on this land for about ten days at the highest level, and then gradually withdrew. It was nearly a month before any of the flooded fields were in condition to work, and some ponds remained for the greater part of the summer. With the exception of hay, crops already sown on this flooded land were badly injured, or destroyed entirely. Crops sown after the flood were very late and gave poor results. Seeding of grain was finished on May 8, on the unflooded land, and on June 11 on the flooded land. Planting corn was commenced on May 18 and finished on June 7. The weather during the early part of the summer was very dry, the total rainfall up to the end of July being only 5.33 inches. As a result, crops of all kinds suffered considerably and yields were not as large as would be expected in a normal season. Alfalfa haying began on June 20, and a good crop was harvested despite injuries from the flood in the lower places. The second cutting was commenced on July 31, and was only a fair crop, being reduced somewhat by the drought. The first grain to be cut was barley, on July 28. Cutting wheat commenced on August 13. The last cutting was oats for green feed on the flooded land, on Septemeber 13. Threshing began on the experimental plots on August 25, and was completed on September 29. Cutting corn commenced on September 12, and silo filling was completed on September 23. Fall ploughing was commenced on September 15 and was completed just before the ground froze up on October 27.

SOME WEATHER OBSERVATIONS taken at Brandon Experimental Farm, 1913.

Month	Temperature F.			Precipitation.				Total sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	Heaviest in 24 hours.	
				Inches.	Inches.	Inches.	Inches.	Hours.
January	-8·5	36·9	-37·6		11	1·10	0·20	73·6
February	-3·8	32·0	-38·6		6	0·60	0·30	112·4
March	7·7	46·4	-29·7		5	0·50	0·30	148·2
April	43·7	82·7	18·1	0·25	1	0·35	0·19	226·4
May	48·5	88	18	1·04		1·04	0·44	199·8
June	60·4	90	32	2·34		2·34	0·97	218·8
July	61·9	95·3	41	1·70		1·70	0·54	228·8
August	64·4	94	41	3·56		3·56	1·48	235·6
September	54	87·3	23	0·68		0·68	0·17	199·1
October	34·4	81·3	-3	0·73		0·73	0·60	137·5
November	27·9	59·7	-3	0·04	3	0·34	0·20	93·1
December	15·7	41·1	-19·8		1	0·10	0·10	112·2
Total for year				10·34	27	13·04		1988·5
Average for 10 years				13·18	49·78	18·15		2021·1
Total for 6 growing months Apr. to Sept., 1913						9·67		1308·5
Average of 10 years for 6 growing months April to September						12·79		1378·3

FIELD CROP YIELDS.

Because of the flood and the drought the yields of grain on both the high and low land were scarcely up to the average. The statement of yields which follows does not include test plots nor special fields of grain grown for seed production.

FIELD CROP AREAS AND YIELDS, Brandon, 1913.

Crop.	Preceding crop.	Acreage.	Total yield.	Yield per acre.
Wheat, Red Fife	Summer-fallow (Rotation D.)	3½	80 bush.	22 bush. 54 lb.
" Red Fife	Summer-fallow (Rotation E.)	3½	81 "	23 " 9 "
" Red Fife	Wheat (Rotation D.)	3½	84 "	24 "
" Red Fife	Wheat (Rotation E.)	3½	79 "	22 " 34 "
" Red Fife*	Clover (Rotation F.)	8½	225 " 30 lb.	26 " 32 "
" Red Fife	Wheat (Rotation F.)	8½	180 "	21 " 11 "
" Red Fife	Pasture (Rotation H.)	4½	57 "	12 " 40 "
" Marquis	Summer-fallow	2¼	91 "	40 " 26 "
" Marquis	Summer-fallow	5	145 "	29 " 00 "
Oats, Banner	Wheat (Rotation D.)	3½	148 "	42 " 19 "
" Banner	Wheat (Rotation E.)	3½	139 "	39 " 24 "
" Banner*	Wheat (Rotation G.)	6	335 "	55 " 50 "
" Banner	Pasture (Rotation Q.)	4	151 "	37 " 26 "
" Banner	Peas (Rotation Q.)	5	160 "	32 "
" Banner	Oats	10	584 "	58 " 14 "
" Banner*	Summer-fallow	2½	116 "	46 " 14 "
" Banner	Summer-fallow	6	603 "	100 " 17 "
" Abundance	Summer-fallow	2	146 "	73 "
" Daubeney	Summer-fallow	2	150 "	75 "
Green oats for feed*	Wheat	10	35 tons.	3 tons. 1,000 lb.
" " *	Flax (Rotation H.)	4½	15 "	3 " 667 "
Barley, O.A.C. No. 21	Corn (Rotation F.)	8½	470 bush.	55 bush. 14 lb.
" O.A.C. No. 21*	Wheat (Rotation G.)	6	247 "	41 " 8 "
" O.A.C. No. 21	Wheat (Rotation H.)	4½	54 "	12 "
" O.A.C. No. 21	Oats	2¾	99 "	36 "
" Manchurian	Flax	3½	230 "	65 " 48 "
Peas, Arthur	Oats (Rotation Q.)	3	52 "	17 " 20 "
Flax, Common	Pasture (Rotation I.)	4½	65 "	14 " 27 "
Corn, Northwestern Dent	Wheat (Rotation F.)	8½	64 tons.	7 tons 1,059 lb.
" "	Pasture (Rotation G.)	6	70 "	11 " 1,333 "
" "	Barley	5	38 "	7 " 1,200 "
" "	Summer-fallow	2½	34 "	13 " 1,200 "
Turnips, Hall's Westbury	Oats, (Rotation Q.)	2	19 " 280 lb.	9 " 640 "
Mangels, Yellow Globe	Barley	2	20 tons. 1,165 lb.	10 " 581 "
Hay, Alfalfa	Alfalfa	15	50 tons.	3 " 667 "
Hay, Clover	Barley (Rotation F.)	8½	13 "	1 " 1,058 "
Hay, Clover	Barley (Rotation G.)	6	15 "	2 " 1,000 "
Hay, Clover	Oats	8	12 "	1 " 1,000 "
Hay, Mixed	Hay (Rotation G.)	6	12 "	2 "
Hay, Mixed	Oats (Rotation H.)	4½	7 "	1 " 1,111 "
Hay, Mixed	Wheat (Rotation I.)	4½	7 "	1 " 1,111 "
Hay, Mixed	Hay	5½	8 "	1 " 909 "
Hay, Mixed	Oats	5½	10 "	1 " 1,634 "
Hay, Mixed	Oats (Rotation Q.)	5	5 "	1 "
Hay, (Brome)	Hay (Rotation Q.)	5	1,000 lb.	" 200 "

* Fields marked thus were seriously injured by flood.

COST OF PRODUCTION OF FIELD CROPS.

The records kept in connection with the crop rotation experiments supply data on the cost of production of various crops. On account of the majority of the rotation fields having been inundated by the flood, there are not many fields from which reliable data can be given this year.

The values used are those that have been fixed for the rotation work on all the western Experimental Farms and Stations. In some instances they are not exactly in accord with this year's prices, but on the whole the data given are probably as nearly applicable to conditions here as can be obtained.

Cost of production of wheat on summer-fallow.

Number of acres: 3½.
Preceding crops: (Rotation D) wheat, oats, fallow.

Rent of land at $2 per acre for 2 years	$14 00
Ploughing previous June, 13 hours, 4-horse team at 48 cents	6 24
Packing after ploughing, 1¾ hours, 4-horse team at 48 cents	0 84
Harrowing after ploughing 2¼ hours, 2-horse team at 34 cents	0 85
Cultivating in July, 5½ hours, 4-horse team at 48 cents	2 64
Cultivating in September, 4¼ hours, 4-horse team at 48 cents	2 04
Seeding, 3½ hours, 2-horse team at 34 cents	1 19
Harrowing, 2¼ hours, 2-horse team at 34 cents	0 76
Binding, 3½ hours, 3-horse team at 41 cents	1 43
Stooking, 4½ hours manual labour at 19 cents	0 86
Threshing, 80 bushels of wheat at 7 cents	5 60
Seed, 5¼ bushels of wheat at $1 per bushel	5 25
Twine, 10¾ pounds at 13½ cents	1 40
Use of machinery, 2 years at 60 cents per acre each year	4 20
Total cost of 3½ acres wheat (including cost of summer-fallow)	$47 30
Cost per acre	$13 51
Yield of wheat per acre ..bushels.	22.85
Cost to produce 1 bushel wheat (value of straw neglected) ..cents.	59.1

Cost of production of wheat following wheat.

Number of acres: 3½.
Preceding crops: (Rotation D.) oats, fallow, wheat.

Rent of land at $2 per acre	$7 00
Quarter share of manure, 6 tons per acre at $1 per ton	5 25
Ploughing in October, 11 hours, 5-horse team at 55 cents	6 05
Discing in April, 3½ hours, 2-horse team at 34 cents	1 19
Seeding, 3 hours 2-horse team at 34 cents	1 02
Harrowing, 4½ hours 2-horse team at 34 cents	1 53
Binding, 3½ hours 3-horse team at 41 cents	1 43
Stooking, 4 hours manual labour at 19 cents	0 76
Threshing, 84 bushels wheat at 7 cents	5 88
Seed, 5¼ bushels wheat at $1 per bushel	5 25
Twine, 11¾ pounds of twine at 13½ cents	1 58
Use of machinery, 3½ acres at 60 cents	2 10
Total cost of 3½ acres wheat	$39 04
Cost per acre	$11 15
Yield of wheat per acre ..bushels	24
Cost to produce 1 bushel wheat (value of straw neglected) ..cents	13.9

Cost of production of wheat sown on clover sod.

Number of acres: 8½.
Preceding crops: (Rotation F.) Wheat, corn, barley, clover.

Rent of land at $2 per acre	$17 00
Ploughing in August, 35 hours, 4-horse team at 48 cents	16 80
Discing, 31 hours, 2-horse team at 34 cents	10 54
Seeding, 7½ hours, 2-horse team at 34 cents	2 55
Harrowing, 12½ hours, 2-horse team at 34 cents	4 25
Binding, 9½ hours, 3-horse team at 41 cents	3 90
Stooking, 10 hours, manual labour at 19 cents	1 90
Threshing, 225½ bushels wheat at 7 cents	15 75
Seed, 12¾ bushels wheat at $1 per bushel	12 75
Twine, 40½ pounds at 13½ cents	5 42
Use of machinery, 8½ acres at 60 cents per acre	5 10
Total cost of 8½ acres of wheat	$95 96
Cost per acre	$11 58
Yield of wheat per acre ..bush.	26.5
Cost to produce 1 bushel wheat (value of straw neglected) ..cents.	42.5

Cost of production of oats, following two crops of wheat.

Number of acres: 3½.
Preceding crops: (Rotation D.) Fallow, wheat, wheat.

Rent of land at $2 per acre	$7 00
Quarter share of manure, 6 tons per acre at $1 per ton	5 25
Ploughing, 10 hours, 4-horse team at 48 cents	4 80
Seeding, 3 hours, 2-horse team at 34 cents	1 02
Harrowing, 4 hours, 2-horse team at 34 cents	1 36
Binding, 3½ hours, 3-horse team at 41 cents	1 43
Stooking, 5 hours manual labour at 19 cents	95
Threshing, 148 bushels oats at 4 cents per bushel	5 92
Seed, 7 bushels oats at 50 cents per bushel	3 50
Twine, 10⅓ pounds at 13½ cents	1 40
Use of machinery, 3½ acres at 60 cents per acre	2 10
Total cost of 3½ acres oats	$34 73
Cost per acre	$ 9 92
Yield of oats per acre ..bush.	42.3
Cost to produce 1 bushel of oats (value of straw neglected) ..cents.	23.4

Cost of production of ensilage corn.

Number of acres: 8½.
Preceding crops: Wheat, wheat, wheat.

Rent of land at $2 per acre	$17 00
One-fifth share of manure, 8 tons per acre at $1 per ton	13 40
Ploughing, 27½ hours, 5-horse team at 55 cents	15 12
Discing and harrowing, 34 hours, 2-horse team at 34 cents	11 56
Rolling, 3½ hours, 2-horse team at 34 cents	1 19
Seeding, 12 hours, 2-horse team at 34 cents	4 08
Cultivating, 74½ hours, 2-horse team at 34 cents	25 33
Cultivating, 25 hours, 1-horse at 27 cents	6 75
Hoeing, 86 hours, manual labour at 19 cents	16 34
Binding, 22 hours, 3-horse team at 41 cents	9 02
Ensiling, 64 tons of corn at 75 cents per ton	48 00
Seed	7 01
Twine	4 40
Use of machinery, 8½ acres at 60 cents per acre	5 10
Total cost of 8½ acres corn	$184 33
Cost per acre	$21 69
Yield of ensilage per acre ..tons.	7.53
Cost per ton placed in silo	$2 88

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ROTATION OF CROPS.

The year has been almost lost so far as experimental work in the rotation of crops is concerned. The flood was the cause which so invalidated our results. The land on which several of the rotations are located, was inundated, other areas again, were partially flooded, and some escaped entirely. This means that the conditions under which the crops in the various rotations were grown, were not comparable. It is thus impossible to be sure whether any differences observed are due to the character of the rotation or to the effect of the flood.

ROTATION "D" (FOUR YEARS' DURATION).

First year.—Wheat.

Second year.—Wheat. Manured preceding fall at rate of 3 tons per acre.

Third year.—Oats.

Fourth year.—Summer-fallow.

Four fields of 3½ acres each are used for this rotation. The soil varies from a sandy to a clayey loam. It was started in 1910, and has been in full operation since 1911.

Rotation "D" may be considered a typical grain farming rotation, except that manure is applied to the land once every four years. An adjoining rotation, "E," has exactly the same order of crops as "D," but differs in that it receives no manure. The manure applied to "D" is charged at the rate of $1 per ton (spread over the rotation). In 1911 and 1912, the increase in crop more than paid for the cost of the manure. This year the unmanured rotation showed the greater profit.

Rotation "D" was not affected by the flood, but did, however, suffer from the dry weather. Field "D 1" in particular, being rather light sandy soil, did not give the yield that can usually be expected from summer-fallowed land.

ROTATION "E" (FOUR YEARS' DURATION).

First year.—Wheat.

Second year.—Wheat.

Third year.—Oats.

Fourth year.—Summer-fallow.

Rotation "E" receives no manure at any time, this being the only difference between it and "D". It is probably used by more of the successful grain farmers of Manitoba than any other rotation.

It consists of four fields of 3½ acres each, lying contiguous to the corresponding fields of "D". The soil varies from a sandy loam to a clay loam. The rotation was started in 1910 and has been in full operation each year since that time.

One striking result already observed in rotations "D" and "E" is the great difficulty in keeping wild oats in check. The three successive grain crops give this weed a splendid opportunity to multiply, and the summer-fallow is not an entirely effective means of eradicating it. This result bears out the observation of many farmers in Manitoba, who find that in growing grain exclusively, it is impossible to keep the wild oats in check, no matter how thoroughly the work of summer-fallowing is done.

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Many seeds of wild oats remain dormant during the summer-fallow, but grow with the following crop of wheat. In the mixed farming rotations, in operation nearby, no such difficulty is experienced.

ROTATION "F" (FIVE YEARS' DURATION).

First year.—Wheat.

Second year.—Wheat.

Third year.—Corn or roots. Manured preceding fall.

Fourth year.—Oats or barley. Seeded with grass and clover.

Fifth year.—Clover hay.

Five fields of 8½ acres each, are used for this rotation.

The soil is a black loam, mostly heavy, but with a lighter ridge running across each field. It was laid down in 1910 and 1911 and has been in full operation since that time. "F 2" and "F 3" were partially flooded, and as they were seeded with wheat before the flood, the wheat was thinner and later than it otherwise would have been.

Rotation "F" is a mixed farming rotation, suited to conditions where it is desired to grow both a considerable quantity of wheat, and a large amount of fodder for stock. It pre-supposes a sufficient area of permanent pasture outside the rotation. It eliminates the summer-fallow.

This rotation is proving a decided success on the Experimental Farm. In a country where summer-fallowing is generally considered essential, it demonstrates the possibility of producing a profitable crop every year. The substitutes for the summer-fallow are: First, corn or roots; and secondly, clover hay. While these crops do not show in themselves any very great profits, they more than pay for the operations they involve and for the overhead charges counted against them, and they leave the land in such a condition that the following crops of grain are more profitable than any grown in the straight grain-growing rotations. The wheat, grown on clover sod which is ploughed in July and well cultivated thereafter, is usually equal in every way to the best summer-fallow crop on the farm. Moreover, the crop of clover hay, which replaces the summer-fallow, has paid its own way and added to the humus of the land in addition. Similarly corn may be substituted for the summer-fallow to advantage, for, while the corn shows a very small profit in itself, the grain (usually barley) that follows is the most cheaply grown on the farm.

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ROTATION "G" (SIX YEARS' DURATION).

First year.—Wheat.

Second year.—Wheat.

Third year.—Oats and barley. Seeded with grass and clover.

Fourth year.—Clover hay.

Fifth year.—Pasture.

Sixth year.—Corn or roots. Manured preceding fall.

Six fields of 6 acres each are allotted to rotation "G." The land is a heavy clay loam. This rotation was the first started on the Experimental Farm and has been in operation four years.

It is a mixed farming rotation, providing for wheat, coarse grains, hay, pasture and fodder corn.

Unfortunately the land for rotation "G" was entirely covered by the flood. Wheat had been sown in "G 1" and "G 2" and a beautiful stand was growing when the flood came. This crop was destroyed, and oats were sown. In "G 2" a fair crop was obtained, but in "G 1" the oats proved such a failure that they were ploughed up. The hay crop was increased by the flood, and that helped to counterbalance the loss on grain crops. The results, however, cannot be considered normal, and this year's figures will not be used in computing averages.

ROTATION "H" (SIX YEARS' DURATION).

First year.—Wheat.

Second year.—Wheat.

Third year.—Summer-fallow.

Fourth year.—Oats. Seeded with grass and clover.

Fifth year.—Hay.

Sixth year.—Pasture. Manured.

Six fields of 4½ acres each comprise the land on which rotation "H" is located. It is a heavy clay loam. The rotation in its present form was started last year, but in a somewhat similar form was in operation for a year previous.

This rotation is suitable for a farm where grain growing is still the principal crop, but where hay and pasture are desired for stock. It includes one summer-fallow, and has no hoed crop. It is therefore suited to the farmer who considers a hoed crop impracticable under present labour conditions.

The land, on which rotation "H" is located, is badly infested with couch grass, and has been in that condition for many years. On that account the results obtained are not comparable with those obtained on the other rotations, and, as they are not fair to the rotation, they are not published. Rotation "H" was also entirely inundated during the flood, and the crops on it were altered from that cause.

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ROTATION "I" (SIX YEARS' DURATION).

First year.—Flax.

Second year.—Oats.

Third year.—Summer-fallow.

Fourth year.—Wheat. Seeded with grass and clover.

Fifth year.—Hay.

Sixth year.—Pasture. Manured.

Six fields of 4½ acres provide the land required for this rotation. These fields lie contiguous to the corresponding fields of rotation "H" and are of the same character. Rotation "I" is suited to conditions such as described for "H." The chief difference between the two rotations is that flax in "I" is substituted for wheat in "H."

The land under "I" is in the same condition in regard to couch grass as that under "H" and for that reason is not reported in detail. This land was also completely flooded this year. An effort is being made to get the couch grass under control on this land, in order that a fair comparison may be made between these two rotations and the others.

ROTATION "Q" (EIGHT YEARS' DURATION).

First year.—Roots and peas.

Second year.—Wheat or oats. Seeded with grass and clover.

Third year.—Hay.

Fourth year.—Hay.

Fifth year.—Pasture.

Sixth year.—Pasture.

Seventh year.—Pasture.

Eighth year.—Green feed and rape. Manured in fall.

This rotation is located in eight fields of 5 acres each on a poor gravelly hill top at the rear of the Experimental Farm. The land is used as a sheep ranch, and the rotation is arranged specially for that purpose. It was in partial operation in 1911 and 1912, and this year was in full operation except that the seeding of the hay and pasture land is much older than the order of the crops would indicate, and, in consequence is less productive. The quality of the land makes the results on this rotation quite incomparable to those obtained on the other rotations situated on good land. They must therefore be considered as a unit by themselves, as indicating what can be done on this poor land by this system. In the fields where a loss is shown, it will be noticed that the chief item of cost is the charge for rent. The uniform charge of $2 per acre made against all the rotations, is made here; it is, of course more than this land is worth, and makes the profits unduly small.

ROTATION "W" (TEN YEARS' DURATION).

First year.—Wheat.

Second year.—Wheat.

Third year.—Corn or roots.

Fourth year.—Oats.

Fifth year.—Barley.

Sixth year.—Alfalfa. Seeded without nurse crop.

Seventh year.—Alfalfa.

Eighth year.—Alfalfa.

Ninth year.—Alfalfa.

Tenth year.—Alfalfa.

The fields varying in size from 1½ acres to 2¾ acres are to be used for this rotation. The soil is a heavy clay loam. The rotation is not yet in full operation. All but two of the ten crops were in their place this year, and next year (1914) it is hoped to have it in full running order.

This is essentially an alfalfa rotation, and consequently has to be long. Alfalfa is expensive to start and profitable to retain, and therefore must be allowed quite a number of consecutive years. This rotation is specially suited to a dairyman or pure bred stock farmer, who wishes to grow a large amount of good feed for his stock.

The following fixed values are being used in this, and similar work here, and at the other prairie branch Farms and Stations.

Cost Values.

Rent	per acre.	$2 00
Barnyard manure spread (charged equally over all years of the rotation)	per ton.	1 00
Seed wheat	per acre	1 50
Seed oats	"	1 00
Seed barley	"	1 00
All other seeds to be charged at actual cost. Cost of grass seed to be charged equally on the years producing grass		
Twine charged at actual cost.		
Machinery	per acre.	60
Manual labour	per hour.	19
Horse labour (including teamster)—		
Single horse	"	27
Two-horse team	"	34
Three-horse team	"	41
Four-horse team	"	48
Additional horses	"	7
Work done by traction engine is to be converted into the amount of horse labour required to do the work and charged accordingly.		
Threshing (covering work from stook to granary)—		
Wheat	per bush.	7
Oats	"	4
Barley	"	5
Flax	"	12
Peas	"	7

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Cutting Fodder Corn, Brandon Experimental Farm.

Return Values.

Wheat (from the machine)	per lb.	1¼c.
Barley " "	"	1c.
Oats " "	"	1c.
Peas " "	"	1½c.
Flax " "	"	3c.
Timothy hay	per ton.	$10 00
Red clover hay	"	10 00
Alfalfa hay	"	12 00
Brome grass hay	"	10 00
Western rye grass hay	"	10 00
Mixed hay	"	10 00
Green hay	"	10 00
Oat straw	"	2 00
Barley straw	"	2 00
Wheat straw	"	1 00
Pea straw	"	2 00
Flax straw	"	2 00
Dry corn stalks	"	5 00
Corn ensilage	"	3 00
Mangels and turnips	"	3 00
Sugar beets	"	4 00
Pasture, each horse	per month.	1 00
" " cow	"	1 00
" " sheep	"	25

ROTATION

Rotation Year.	Crops. 1912.	Crops. 1913.	Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours Manual Labour.	Manual labour. Cost of Manual Labour.	Horse labour (including teamster.) Hours. Single horse.	2-horse team	3-horse team	4-horse team	5-horse team
			Ac.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
1st	Fallow	Wheat	3·5	7 00	8 75	4½	0 86		5½	3½	4½	
2nd	Wheat	Wheat	3·5	12 25	8 93	4	0 76		11	3½		11
3rd	Wheat	Oats	3·5	12 25	7 00	5	0 95		7	3½	10	
4th	Oats	Fallow	3·5	12 25	2 10				20½		27½	
	Aggregate		14	43 75	26 78	13½	2 57		44½	10½	41¾	11
	Average per acre			3 13	1 91		0 18					

ROTATION

1st	Fallow	Wheat	3·5	7 00	8 58	4½	0 86		5½	3½	4½	
2nd	Wheat	Wheat	3·5	7 00	8 75	4	0 76		11	3½		11
3rd	Wheat	Oats	3·5	7 00	7 18	5	0 95		7	3½	10	
4th	Oats	Fallow	3·5	7 00	2 10				20		27½	
	Aggregate		14	28 00	26 61	13½	2 57		44½	10½	41¾	11
	Average per acre			2 00	1 90		0 19					

ROTATION

1st	Hay	Wheat	8·5	17 00	23 27	10	1 90		51	9½	35	
2nd	Wheat	Wheat	8·5	17 00	23 27	10	1 90		23½	9		27
3rd	Wheat	Corn	8·5	30 40	16 54	86	16 34	25	124	22		27½
4th	Corn	Barley	8·5	30 40	26 85	15	2 85		20½	13	5	
5th	Barley	Hay	8·5	30 40	46 19	30	5 70	6	17½			
	Aggregate		42·5	125 20	136 12	151	28 69	31	240½	52½	40	54½
	Average per acre			2 94	3 20		0 68					

ROTATION

1st	Corn	Wheat	6	20 00	18 60				67½		35½	
2nd	Wheat	Oats	6	20 00	23 85	17	3 23		32½	7½	20	
3rd	Wheat	Barley	6	20 00	12 75	16	3 04		22½	7½	18	
4th	Barley	Hay	6	12 00	14 55	30	5 70		42			
5th	Hay	Pasture (hay)	6	12 00	10 50	28	5 32		47			
6th	Pasture	Corn	6	20 00	13 20	226	42 94	10	63	13	42½	
	Aggregate		36	104 00	93 45	317	60 23	10	194½	28	116	
	Average per acre			2 88	2 60		1 67					

"D." (Four years' duration.)

IN RAISING CROP.							PARTICULARS OF CROP.						
							Weight.						
Value of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of Stubble.	Grain.	Straw.	Hay.	Hoed crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	$ c.	$ c.		Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
5 42	5 60	27 63	7 89	0 59	.....	.....	4,800	8,000	.....	.....	68 00	19 43	11 54
11 22	5 88	39 04	11 15	0 46	.....	.....	5,040	9,000	.....	.....	71 70	20 49	9 34
8 61	5 92	34 73	9 92	0 23½	.....	.....	5,032	8,000	.....	.....	58 32	16 69	6 74
20 25	.....	34 60	9 89	.....	.....	.....	.....	.....	.....	.....	.....	.....	−9 89
45 50	17 40	136 00	.....	.....	.....	.....	.....	.....	.....	.....	198 02	.....	.....
3 25	1 25	.....	9 72	.....	.....	.....	.....	.....	.....	.....	.....	14 15	4 43

"E." (Four years' duration.)

5 42	5 67	27 53	7 87	0 58	.....	.....	4,860	7,000	.....	.....	68 30	19 55	11 68
11 22	5 53	33 26	9 50	0 42	.....	.....	4,740	8,000	.....	.....	67 20	19 20	9 70
8 61	5 56	29 30	8 37	0 21	.....	.....	4,626	9,000	.....	.....	55 26	15 77	7 40
20 25	.....	29 35	8 39	.....	.....	.....	.....	.....	.....	.....	.....	.....	−8 39
45 50	16 76	119 44	.....	.....	.....	.....	.....	.....	.....	.....	190 76	.....	.....
3 25	1 19	.....	8 53	.....	.....	.....	.....	.....	.....	.....	.....	13 62	5 09

"F." (Five years' duration.)

38 04	15 75	95 96	11 29	0 42	.....	.....	13,530	31,000	.....	.....	195 50	23 05	11 76
26 53	12 60	81 30	9 56	0 45⅗	.....	.....	10,800	31,000	.....	.....	159 50	18 77	9 26
73 05	48 00	184 33	21 68	.....	.....	.....	.....	.....	.....	128,000	192 00	22 58	0 91
14 70	23 50	98 30	11 56	0 21	.....	.....	22,560	32,000	.....	.....	257 60	30 31	18 70
7 57	.....	89 86	10 57	.....	.....	.....	.....	.....	26,000	.....	130 00	15 29	4 75
159 89	99 85	549 75	.....	.....	.....	.....	.....	.....	.....	.....	934 60	.....	.....
3 76	2 35	.....	12 93	.....	.....	.....	.....	.....	.....	.....	.....	22 00	9 07

"G." (Six years' duration.)

39 99	.....	78 59	13 10	.....	.....	.....	.....	.....	.....	.....	.....	.....	−13 10
23 72	13 40	84 20	14 03	0 25	.....	.....	12,070	30,000	.....	.....	150 70	25 11	11 00
19 36	12 35	67 50	11 25	0 27	.....	.....	11,856	18,000	.....	.....	136 56	22 76	11 51
14 28	.....	46 53	7 76	.....	.....	.....	.....	.....	3,000	.....	162 00	27 00	19 24
15 98	.....	43 80	7 30	.....	.....	.....	.....	.....	2,400	.....	132 00	22 00	14 70
49 85	52 50	178 49	29 41	.....	.....	.....	.....	.....	.....	140,000	210 00	35 00	5 59
163 18	78 25	499 11	.....	.....	.....	.....	.....	.....	.....	.....	791 26	.....	.....
4 53	2 17	.....	13 86	.....	.....	.....	.....	.....	.....	.....	.....	21 98	8 12

BRANDON.

ROTATION

Rotation Year	Crops.		Area.	Items of Expense								
				Rent and manure.	Seed, twine and use of machinery.	Manual labour.		Horse labour (including teamster.)				
								Hours.				
						Hours Manual Labour.	Cost of Manual Labour.	Single horse	2-horse team	3-horse team	4-horse team	5-horse team
	1912.	1915.	Ac.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
1st	Oats and rape	Roots and peas	5	20 00	15 00	174	33 06	17	46		9	
2nd	Roots and peas	Oats	5	20 00	10 10	6	1 14		29½	6	3	
3rd	Oats and alfalfa	Hay	5	20 00	6 98	13	2 47		19½			
4th	Hay	Hay	5	10 00	3 00	1	0 19		11½			
5th	Hay	Pasture	5	10 00					5½			
6th	Pasture	Pasture	5	10 00					4½			
7th	Pasture	Pasture	5	10 00					4½			
8th	Pasture	Oats and rape	5	10 00	10 62	5	0 95	6	46	5	17	
	Aggregate		40	110 00	45 70	199	37 81	23	167	11	29	
	Average per acre			2 75	1 14		0 94					

"Q." (Eight years' duration.)

In raising Crop.							Particulars of Crop.						
							Weight.						
Value of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel	Cost for 1 ton.	Height of Stubble.	Grain.	Straw.	Hay.	Hoed Crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	$ c.	$ c.		Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
24 55	3 64	96 25	19 25	.....	.....	.....	3,120	5,000	.....	38,280	109 22	21 84	2 59
13 93	6 40	51 57	10 31	.....	.....	.....	5,440	16,000	.....	.....	70 40	14 08	3 77
6 63	.....	36 08	7 21	.....	.....	.....	.....	.....	10,000	.....	54 00	10 80	3 59
3 99	.....	17 18	3 40	.....	.....	.....	.....	.....	1,000	.....	10 25	2 05	−1 39
1 78	.....	11 78	2 36	.....	.....	.....	.....	.....	.....	.....	21 00	4 20	1 84
1 53	.....	11 53	2 31	.....	.....	.....	.....	.....	.....	.....	21 00	4 20	1 89
1 53	.....	11 53	2 31	.....	.....	.....	.....	.....	.....	.....	10 50	2 10	−0 21
27 47	6 04	55 08	11 02	.....	.....	.....	5,134	7,000	.....	.....	65 84	13 17	2 15
81 41	16 08	291 00	.....	.....	.....	.....	.....	.....	.....	.....	362 21	.....	.....
2 04	0 40	.....	7 27	.....	.....	.....	.....	.....	.....	.....	.....	9 06	1 79

SOIL CULTURAL EXPERIMENTS.

Soil cultural experiments inaugurated in 1911 for the purpose of investigating some of our more important problems in soil cultivation have been carefully carried out. The results do not yet supply much decisive information and little comment is therefore made in connection with the various experiments recorded.

DEPTH OF PLOUGHING WHEAT STUBBLE TO BE SOWN TO OATS.

The land was ploughed and packed in October, 1912. In the spring it was harrowed and the seed sown May 7, at the rate of 2¼ bushels per acre. The oats came up on all plots May 23, headed out July 9, ripened August 14, were cut August 14, and threshed September 2.

DEPTH OF PLOUGHING Wheat Stubble to be sown to Oats.

Plot No.	Depth of ploughing wheat stubble, fall of 1912.	Yield of oats per acre, 1913.	
		Grain.	Straw.
		Lb.	Lb.
1	Ploughed 3 inches deep	3,260	3,340
2	Ploughed 4 inches deep	3,240	3,320
3	Ploughed 5 inches deep	3,390	3,330

There is a slight advantage in favour of ploughing 5 inches deep, but the difference is hardly great enough to be regarded as conclusive.

DEPTH OF PLOUGHING SUMMER-FALLOW TO BE SOWN TO WHEAT.

The summer-fallow was ploughed in June, 1912, packed immediately, cultivated twice afterwards during the season, and harrowed after each packing or cultivating. In the spring it was cultivated and harrowed again, and the wheat was sown April 25, at the rate of 1⅝ bushels per acre. All plots came up May 14, headed out July 6, ripened August 12, were cut August 13 and threshed August 28.

DEPTH OF PLOUGHING Summer-fallow to be sown to Wheat.

Plot No.	Depth of ploughing summer fallow, 1912.	Yield of wheat per acre, 1913.	
		Grain.	Straw.
		Lb.	Lb.
1	Ploughing 3 inches deep	3,720	5,000
2	Ploughing 4 inches deep	3,640	4,880
3	Ploughing 5 inches deep	3,390	4,410
4	Ploughing 6 inches deep	3,530	4,590
5	Ploughing 7 inches deep	3,360	4,280
6	Ploughing 8 inches deep	3,750	6,850
7	Ploughing 5 inches deep and subsoiling 4 inches	2,850	3,270
8	Ploughing 6 inches deep and subsoiling 4 inches	3,120	4,600
9	Ploughing 7 inches deep and subsoiling 4 inches	3,220	4,020
10	Ploughing 8 inches deep and subsoiling 4 inches	2,920	4,240

The results obtained would indicate that subsoiling was injurious rather than helpful, since the four subsoiled plots were lower in yield than any of the others. It is impossible to gather much information from the results on the other plots, as ploughing eight inches deep gave the best returns while three inches deep was a close second, with the other plots showing no regular gradation in yield.

DEPTH OF PLOUGHING SOD TO BE SOWN TO WHEAT.

After the hay was cut, 1912, the land was ploughed August 3, double disced the same day and again October 7. It was harrowed twice in the spring, and the wheat was sown April 17, at the rate of 1¾ bushels per acre. All plots came up May 3, headed out June 24, ripened August 5, were cut August 5, and threshed August 28.

The experiment has not yet been in operation long enough to note the results of the stubble ploughing following the sod.

DEPTH OF PLOUGHING Sod to be sown to Wheat followed by Oats.

Plot No.	Depth of ploughing sod, 1912.	Yield of wheat per acre on sod.	Yield of oats per acre on wheat stubble.
		Lb.	Lb.
11	Ploughing three inches deep sod and stubble	2,300	3,400
12	Ploughing four inches deep sod and stubble	2,660	3,130
13	Ploughing five inches deep sod and stubble	2,820	3,610
14	Ploughing three inches deep on sod and six inches deep fall or spring after wheat	2,690	3,600

The deep ploughing has the advantage in point of yield and, moreover, the grass was subdued better by the deep than by the shallow ploughing.

SUMMER-FALLOW TREATMENT.

With the exception of plots 11 and 13, which were ploughed May 17 and July 17 respectively, the land received the first ploughing of the fallow June 12 and 13, 1912. The plots that were ploughed twice received their second ploughing September 4, 1912. All except plot 17 were packed immediately after the first ploughing. Plots 1 to 9 were cultivated once in July and once in August, and harrowed after each cultivation. Plot 10 was well harrowed and sown to rape on June 17, which was pastured by pigs, beginning August 13. Plot 11 was cultivated three times during the summer, plot 12 twice, and plot 13 only once. Plots 14 to 17 were cultivated twice (July and August). All plots were harrowed after each cultivation. After harrowing in the spring, all plots were sown to wheat April 16. All came up April 29. Plots 1 to 9 headed out June 30 and plots 10 to 17 June 26. They were cut August 4 and threshed August 6.

TREATMENT OF SUMMER-FALLOW to be sown to Wheat.

Plot No.	Treatment of Summer-fallow, 1912.	Date of Ripening.	Yield of wheat per acre.	
			Grain.	Straw.
			Lb.	Lb.
1	Plough 4 inches, June, pack if necessary and practicable, cultivate as necessary	Aug. 4	2,420	4,020
2	Plough 6 inches, June, pack if necessary and practicable, cultivate as necessary	" 4	2,740	3,460
3	Plough 8 inches, June, pack if necessary and practicable, cultivate as necessary	" 4	2,670	3,850
4	Plough 4 inches, June, cultivate. Plough 4 inches, September, harrow	" 6	2,850	3,790
5	Plough 6 inches, June, cultivate. Plough 6 inches September, harrow	" 6	2,730	3,990
6	Plough 8 inches, June, cultivate. Plough 8 inches, September, harrow	" 6	2,730	3,990
7	Plough 6 inches, June, cultivate... Plough 4 inches, September, harrow	" 6	2,870	3,770
8	Plough 4 inches, June, cultivate... Plough 6 inches, September, harrow	" 6	2,780	3,820
9	Plough 4 inches, June, early as possible, cultivate. Plough 6 inches, September, leave untouched	" 6	2,610	3,670
10	Plough 5 inches, June, seed to rape or other green forage crop and pasture off	" 4	2,770	3,270
11	Plough 6 inches, May 15, harrow and pack if necessary, cultivate as necessary	" 4	2,950	3,810
12	Plough 6 inches, June 15, harrow and pack if necessary, cultivate as necessary	" 4	2,750	3,850
13	Plough 6 inches, July 15, harrow and pack if necessary, cultivate as necessary	" 4	2,920	4,320
14	Fall cultivate, before summer-fallowing. Plough 6 inches, June, harrow and pack if necessary, cultivate as necessary	" 4	2,840	4,240
15	Fall plough 4 inches before summer-fallowing. Plough 6 inches, June, harrow and pack if necessary, cultivate as necessary	" 4	2,750	4,330
16	Plough 6 inches, June, pack, cultivate as necessary	" 4	3,120	4,000
17	Plough 6 inches, June, no packing, otherwise same as other plots	" 4	2,720	3,720

The plots that were ploughed twice were uniformly two days later than those that were ploughed only once. Plots 16 and 17 considered by themselves seem to show a decided advantage for soil packing. When, however, it is remembered that all plots except plot 17 were packed, and that plot 12 received identical treatment with plot 16, this result is not so clear. A note on the condition of the crop shows that plot 13, ploughed in July, was much weedier than the others.

STUBBLE TREATMENT.

The plots on which this experiment was conducted grew wheat in 1912. The experimental treatment of the stubble land, as described below, was performed in the fall of 1912 and spring of 1913. Plots 1 to 10 were sown to wheat April 17, at the rate of 1½ bushels per acre. Plots 2 and 3 came up May 2, plot 5 May 3, and the others May 4. Plots 1, 2, 3, 5 and 10 headed out June 27, plots 4, 6, 7, and 9 June 28 and plot 8 June 29. All ripened August 5, were cut August 5, and threshed August 29.

Plots 11 to 13 were sown to oats May 7. All came up May 23, headed out July 9, ripened August 14, were cut August 14 and threshed September 2.

BRANDON.

TREATMENT OF WHEAT STUBBLE to be sown to Wheat.

Plot No.	Treatment given wheat stubble preceding wheat.	Yield of Wheat per acre, 1913.	
		Grain.	Straw.
		Lb.	Lb.
1	Plough, autumn	1,670	2,170
2	Disc harrow, autumn	1,670	1,690
3	Burn stubble—then disc, autumn	1,600	1,840
4	Burn stubble—then plough, autumn	1,630	2,010
5	Burn stubble in spring—seed at once	1,340	1,700
6	Plough in spring—seed at once	1,670	1,930
7	Disc at cutting time—spring plough	1,650	1,510
8	Disc at cutting time—autumn plough	1,790	1,850
9	Plough, autumn—subsurface pack at once	1,690	1,990
10	Plough, spring—seed—subsurface pack	1,680	1,960

TREATMENT OF WHEAT STUBBLE to be sown to Oats.

Plot No.	Treatment given wheat stubble preceding oats.	Yield of oats per acre, 1913.	
		Grain.	Straw.
		Lb.	Lb.
11	Plough, autumn,—subsurface pack at once	2,340	1,860
12	Plough, spring—seed, subsurface pack	2,280	1,640
13	Cultivate, autumn—spring plough, seed	2,550	2,410

Plots 2, 3 and 5, which were not ploughed, were conspicuously weedy, as compared to the ploughed plots. The difference in yield between the discing and ploughing is hardly as great as would be expected. Plot 5, which received no cultivation is the lowest in yield of any, as might be expected. The three plots on which the stubble was burned are the three lowest in yield. No very distinct difference can be observed between spring and fall ploughing, but what advantage there is, is in favour of fall ploughing. In the case of oats, the plot that was cultivated (disced) in the fall and ploughed in the spring, gave best results.

SEEDING TO GRASS AND CLOVER.

The group of plots which reached the result-producing stage in this experiment in 1913, were seeded as per the directions given below, in the year 1912. Plots 1 to 8 received the required preparatory treatment in previous years. Plots 9, 10 and 11, requiring two previous grain crops, did not have more than one, as the experiment was laid out only in 1911, and the land was in summer-fallow in 1910. The first crop was cut June 27 and the second August 22.

SEEDING to Grass and Clover.

Plot No.	Method of seeding.	Yield of hay per acre.		
		First cutting.	Second cutting.	Total.
		Lb.	Lb.	Lb.
1	Seeding rye grass 10 lb. and red clover 10 lb. with nurse crop on summer-fallow	6,760	1,960	8,720
2	Seeding rye grass 10 lb. and red clover 10 lb. alone after summer fallow	8,720	2,600	11,320
3	Seeding rye grass 10 lb. and red clover 10 lb. with nurse crop on first year after hoed crop	6,360	3,320	9,680
4	Seeding rye grass 10 lb. and red clover 10 lb. alone after hoed crop	7,160	3,040	11,200
5	Seeding rye grass 10 lb. and red clover 10 lb. with nurse crop on first year wheat stubble	4,040	2,960	7,000
6	Seeding rye grass 10 lb. and red clover 10 lb. alone after first year wheat	5,280	2,360	7,640
7	Seeding rye grass and red clover, with oats to cut green, on first year wheat stubble	4,280	2,560	6,840
8	Seeding rye grass 10 lb. and red clover 10 lb. alone on first year wheat stubble, manured 8 tons per acre, ploughed preceding fall	4,720	2,440	7,160
9	Seeding rye grass 10 lb. and red clover 10 lb. with nurse crop on second year wheat stubble	4,680	2,080	6,760
10	Seeding rye grass 10 lb. and red clover 10 lb. alone after second year grain (oats)	3,800	1,920	5,720
11	Seeding rye grass 10 lb. and red clover 10 lb. with nurse crop on second year after hoed crop	4,640	2,160	6,800

The yield on plot 10 was reduced by causes other than the experimental treatment. The seeding on land that was in summer-fallow or hoed crop the previous year was decidedly the best. Seeding alone gives a better yield than with a nurse crop, but not enough better on this land to pay for the lost crop of grain. Possibly on uninoculated or light land the advantage of seeding alone would be greater.

BREAKING SOD FROM CULTIVATED GRASSES AND CLOVERS.

The following methods are being tried in this experiment:—

1. Plough 5 inches July 20 to 30, pack and disc at once, disc in fall.
2. Plough 5 inches October, pack, disc harrow.
3. Plough 3 inches early July, backset September, cultivate as necessary.
4. Stiff-tooth rip July, plough 5 inches September, cultivate.
5. Spring plough 5 inches deep, seed same spring to wheat.
6. Duplicate No. 5, sow flax.
7. Repeat No. 5, sow peas.
8. Plough May 15, work as summer-fallow.

No results are available in this experiment as yet. The land was seeded in 1911 and produced hay in 1912. The first set of plots have received the experimental treatment this year 1913, and should give results in 1914.

APPLICATION OF BARNYARD MANURE.

Application of barnyard manure for corn and roots.

Turnips were used in this experiment. Plots 1 to 7 grew wheat the two previous years. Plots 8 and 9 were summer-fallowed the previous year. The manure was applied to each plot as per directions given below. The turnips were sown May 15 and pulled on October 1.

BRANDON.

Application of Barnyard Manure for Roots.

Plot No.	Application of Manure.	Yield of turnips per acre, 1913.
		Lb.
1	No manure, plough second-year stubble in autumn	21,200
2	Apply in autumn after ploughing second-year stubble, work in at once	30,600
3	Apply in spring on autumn ploughed second-year stubble, work in at once	28,800
4	Apply in autumn on second year stubble, plough under in autumn	30,400
5	Apply in spring on second-year stubble, plough under in spring	22,800
6	Apply in winter on second-year stubble, plough under in spring	24,800
7	Apply in winter green manure (cut straw) on second-year stubble, plough under in spring	28,000
8	Apply in winter green manure (cut straw) on summer-fallow, disc in	32,400
9	Summer-fallow, no manure	30,800

Plots 1 to 7 gave an average crop of 27 bushels of wheat per acre in 1912. Allowing for this, plots 8 and 9 have not given sufficient extra crop to pay for the wheat which was lost by the summer-fallowing.

The fall application of manure either before or after fall ploughing seems to have the advantage over winter or spring application.

Application of Barnyard Manure for Wheat.

In this experiment there is followed a rotation of summer-fallow, wheat, wheat. In the case of plots 2 and 4 the manure is applied to affect the wheat crop after summer-fallow, whereas in the remaining plots it is applied to affect the second wheat crop of the rotation. To make a fair comparison of the different methods of application it is therefore necessary to average the yields for the two crop-producing years of the rotation.

Application of Barnyard Manure for Wheat.

Plot No.	Application of Manure.	Yield of wheat per acre on summer-fallow.	Yield of wheat per acre on wheat stubble.	Average yield of wheat per acre for entire rotation.
		Lb.	Lb.	Lb.
1	Apply in winter green manure (cut straw) on first-year stubble, disc in	2,920	*1,810	2,365
2	Apply in winter green manure (cut straw) on summer-fallow, disc in	*3,140	2,310	2,725
3	Top dress, with spreader, grain sown on first-year stubble	3,220	*2,620	2,920
4	Top dress, with spreader, grain sown on summer-fallow	*3,350	2,360	2,855
5	No manure, plough first-year stubble in autumn	3,060	2,520	2,790
6	Apply on surface first-year stubble, plough under in autumn	3,130	*2,680	2,905
7	Apply on surface first-year stubble, plough under in spring	3,030	*3,400	3,215
8	No manure, disc first-year stubble in autumn	3,190	2,300	2,745
9	No manure, burn first-year stubble	3,120	2,340	2,730

* Indicates plots on which manure was applied this year.

Application of Barnyard Manure for Barley.

In this experiment a three-year rotation has been adopted as follows:—

First year.—Summer-fallow.

Second year.—Wheat, or barley where indicated.

Third year.—Barley, or oats where indicated. Where barley follows summer-fallow oats follow barley.

Owing to the different cropping systems followed a comparison of all the methods of application is somewhat difficult. Plots 2 and 4, in which barley is sown on summer-fallow and followed by oats, must be considered apart from the remaining plots where the barley is sown on wheat stubble which follows summer-fallow. Barley and oats are valued at one cent and wheat at one and one-third cents per pound and the average value per acre of the two crops taken, so that the comparative results of the different methods of application may be clearly shown.

Application of Barnyard Manure for Barley.

Plot No.	Application of Manure.	Yield per acre of wheat on summer-fallow.	Yield per acre of barley on wheat stubble.	Value per acre of crops for entire rotation.
		Lb.	Lb.	$ cts.
1	Apply in winter green manure (cut straw) on first year stubble, disc in	3,020	2,420	32 23
3	Top dress, with spreader, barley sown on first year stubble	2,980	2,790	33 81
5	No manure, plough first-year stubble in autumn	2,970	2,910	34 35
6	Apply on first-year stubble, plough under in autumn	3,180	3,160	37 00
7	Apply on first-year stubble, plough under in spring	3,020	3,060	35 43
8	No manure, disc first-year stubble in autumn	3,040	2,550	33 01
9	No manure, burn first-year stubble	3,200	2,830	35 48

Application of Barnyard Manure for Barley.

Plot No.	Application of Manure.	Yield per acre of barley on summer-fallow.	Yield per acre of oats on barley stubble.	Average value per acre of crops for entire rotation.
		Lb.	Lb.	$ cts.
2	Apply in winter green manure (cut straw) on summer-fallow, sow barley on summer-fallow	3,330	3,330	33 30
4	Top dress, with spreader, barley sown on summer-fallow	3,180	3,950	35 65

Application of Barnyard Manure for Oats.

In this experiment a three-year rotation has been adopted as follows:—

First year.—Summer-fallow.
Second year.—Wheat, or oats where indicated.
Third year.—Oats or barley where indicated.

As in the previous experiment the different cropping systems followed make it necessary to consider plots 2 and 4 apart from the remaining plots, and to average the value of both crops of the rotation in order to make a fair comparison of the different methods of applying manure. Oats and barley are valued at one cent and wheat at one and one-third cents per pound.

Application of Barnyard Manure for Oats.

Plot No.	Application of Manure.	Yield per acre of wheat on summer-fallow.	Yield per acre of oats on wheat stubble.	Average value of crops per acre for entire rotation.
		Lb.	Lb.	$ cts.
1	Apply in winter green manure (cut straw) on first-year stubble, disc in	2,870	3,770	37 98
3	Top dress, with spreader, oats sown on first-year stubble	3,200	4,110	41 88
5	No manure, plough first-year stubble in autumn	3,080	4,200	41 53
6	Apply on first-year stubble, plough under in autumn	3,190	4,830	45 41
7	Apply on first-year stubble, plough under in spring	3,160	4,240	42 26
8	No manure, disc first-year stubble in autumn	3,390	4,150	44 40
9	No manure, burn first-year stubble	3,070	4,360	42 26

Application of Barnyard Manure for Oats.

Plot No.	Application of manure.	Yield per acre of oats on summer-fallow.	Yield per acre of barley on oat stubble.	Average value per acre of crops for entire rotation.
		Lb.	Lb.	$ c.
2	Apply in winter green manure (cut straw) on summer-fallow, sow oats on summer-fallow	4,300	2,870	35 85
4	Top dress with spreader, oats sown on summer-fallow	4,360	3,310	38 35

GREEN MANURING.

A group of plots in this experiment was given the prescribed treatment in 1912 and grew wheat this year, 1913. The wheat was sown April 19, at the rate of 1⅝ bushels per acre. It came up on all plots May 5. Plot 5 headed out June 29, and the others one day later. All ripened August 9, were cut August 9 and threshed August 30.

GREEN MANURING for Wheat, followed by Oats.

Plot No.	Treatment of land year previous to wheat.	Yield of wheat per acre, 1913.	
		Grain.	Straw.
		Lb.	Lb.
1	Summer-fallow	3,100	3,100
2	Peas, two bushels Golden Vine (or other similar variety) ploughed under early in July	3,100	4,180
3	Peas, two bushels Golden Vine, ploughed under when in blossom	3,070	3,970
4	Tares, one bushel per acre, ploughed under late in July	3,060	3,900
5	Summer-fallow. Barnyard manure, 12 tons per acre, applied on summer-fallow in September	3,620	4,300
6	Summer-fallow	3,060	4,060

No difference is apparent between a green manuring crop and a bare summer-fallow. Barnyard manure shows a decided advantage over both.

SEED-BED PREPARATION.

The purpose of this experiment is to find out the degree to which work in preparing a seed-bed for grain—wheat and oats—may be carried with profit. The wheat was grown on summer-fallowed land, which was uniformly treated, so that the difference in preparation lay entirely in the work done in the spring before seeding. Plot 1 received no spring work; plot 2 received three strokes of the harrow; plot 3 was packed with the surface packer, cultivated with a stiff tooth cultivator, and harrowed four times. The wheat was sown April 19. All plots matured on the same date, though plot 3 was one day earlier in heading out.

PREPARATION of Seed Bed for Wheat.

Plot No.	Treatment given seed bed.	Yield of wheat per acre, 1913.		Yield of wheat per acre average of 2 years.	
		Grain.	Straw.	Grain.	Straw.
		Lb.	Lb.	Lb.	Lb.
1	Good preparation	3,090	3,950	2,265	3,855
2	Poor preparation	3,210	4,190	2,425	4,075
3	Extraordinary preparation	3,280	4,080	2,420	4,860

This experiment was also conducted with oats sown on wheat stubble. The three plots were equally well ploughed and packed in the fall of 1912. Plot 1 was harrowed once in the spring and sown; plot 2 was harrowed seven times and packed in the spring, the ground was hard and rather lumpy, rendering this amount of work necessary to give "good" cultivation; plot 3 was harrowed nine times and packed three times. The oats were sown May 7. No difference in growth could be noted at any time.

BRANDON.

PREPARATION of Seed Bed for Oats.

Plot No.	Treatment given seed-bed.	Yield of oats per acre 1913.		Yield of oats per acre average of 2 years.	
		Grain.	Straw.	Grain.	Straw.
		Lb.	Lb.	Lb.	Lb.
1	Poor preparation	2,970	2,350	3,005	3,655
2	Good preparation	2,960	2,440	3,300	3,600
3	Extraordinary preparation	3,190	2,410	3,415	3,385

SOIL PACKING FOR WHEAT SOWN ON SUMMER-FALLOW.

The plots for this experiment were summer-fallowed in 1913. Plots 15 to 20 were packed after the ploughing. All plots received sufficient summer cultivation to keep them clean. In the spring, the experimental treatment described below, was applied. The wheat was sown April 17, at the rate of 1½ bushels per acre. Plots, 2, 3, 6, 8, 9, 10, 11, 23, 24 and 25 came up May 1; the remaining plots came up the next day. No difference in earliness could be observed at heading out or ripening time. All were cut August 5 and threshed August 28.

SOIL PACKING in Preparation for Wheat following Summer-fallow.

Plot No.	Cultural treatment given.		Yield of wheat per acre, 1913.	
			Grain.	Straw.
			Lb.	Lb.
1	Harrow, seed	Spring work when seeding.	2,920	4,040
2	" " surface pack		3,090	4,190
3	" " " harrow		2,660	4,540
4	" " subsurface pack		3,030	4,170
5	" " " harrow		2,910	3,930
6	" " combination pack		3,030	3,850
7	" " " harrow		3,110	4,370
8	Surface pack, seed, surface pack		3,060	4,140
9	Subsurface pack, seed, subsurface pack		3,080	4,200
10	Combination pack, seed, combination pack		2,940	4,220
11	Surface pack, harrow, seed		3,200	4,280
12	Subsurface pack, harrow, seed		3,060	4,500
13	Combination pack, harrow, seed		3,220	4,420
14	Harrow, seed		3,120	4,320
15	Plough for summer-fallow, surface pack, cultivate; next spring, smoothing harrow, seed		3,080	4,480
16	Plough for summer-fallow, subsurface pack, cultivate; next spring, smoothing harrow, seed		3,120	4,500
17	Plough for summer-fallow, combination pack, cultivate; next spring, smoothing harrow, seed		3,080	4,740
18	Plough for summer-fallow, surface pack, cultivate; next spring, smoothing harrow, seed, surface pack		3,320	5,240
19	Plough for summer-fallow, subsurface pack, cultivate; next spring, smoothing harrow, seed, subsurface pack		3,370	4,750
20	Plough for summer-fallow, combination pack, cultivate; next spring, smoothing harrow, seed, combination pack		3,560	4,720
21	Harrow, seed	Spring work when seeding.	3,180	4,940
22	" " harrow when 6 inches high		3,000	4,880
23	" " surface pack when 6 inches high		2,950	4,090
24	" " roll when 6 inches high		2,840	4,320
25	" "		2,890	3,990

The land for this experiment was very firm this spring, and obviously was not in great need of packing. It was therefore to be expected that the packing would not have a decidedly beneficial effect. From the figures obtained we would not make any observations as to which kind of packer will give best results, nor as to what time of packing is best, but might point out that the three plots packed after ploughing in the summer, and again after seeding in the spring gave the highest yields.

Soil Packing for Wheat Sown on Spring Ploughed Stubble Land.

The plots for this experiment grew wheat in 1912. They were ploughed April 16 and treated as described below. The wheat was sown April 17 at the rate of 1½ bushels per acre. Considerable variations was observed in the time required for germination, heading out, and ripening, as will be noted in the following table:—

Soil Packing for Wheat sown on Spring Ploughed Stubble Land.

Plot No.	Cultural treatment given.	Date of coming up.	Date of ripening.	Yield of wheat per acre, 1913.	
				Grain.	Straw.
				Lb.	Lb.
1	Harrow, subsurface pack, harrow, seed.....	May 2	Aug. 7	2,380	2,860
2	" surface pack, harrow, seed.....	" 1	" 7	2,300	2,940
3	" combination pack, harrow, seed..	" 1	" 7	2,120	2,680
4	" subsurface pack, harrow, seed, subsurface pack.....	" 2	" 7	2,440	2,560
5	" surface pack, harrow, seed, surface pack.....	" 1	" 7	2,330	2,590
6	" combination pack, harrow, seed, combination pack.....	" 1	" 8	2,220	2,660
7	" seed, harrow.....	" 4	" 8	2,120	2,560
8	" " surface pack.....	" 2	" 8	2,300	2,740
9	" " subsurface pack.....	" 4	" 8	2,260	2,340
10	" " combination pack.....	" 3	" 8	2,250	2,670
11	" "	" 4	" 8	2,140	2,420

We are unable to draw any conclusion from these results except that the two unpacked plots were a little later and more uneven in germinating.

Soil Packing for Wheat on Fall Ploughed Stubble Land.

The plots for this experiment grew wheat in 1912. They were ploughed October 10, 1912. Those on which fall packing is given were packed October 15. The spring packing was done April 16 and 18. Wheat was sown April 19, at the rate of 1½ bushels per acre. The date of coming up and ripening is given in tabular form below. All headed out June 28, except plot 22, which was two days later.

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Some of the Cultural Experimental Plots. Brandon Experimental Farm.

Soil Packing for Wheat sown on Fall Ploughed Stubble Land.

Plot No.	Cultural treatment given.	Date of coming up.	Date of ripening.	Yield of wheat per acre	
				Grain.	Straw.
				Lb.	Lb.
12	No packer, harrow, seed	May 3	Aug. 8	2,200	2,400
13	Subsurface pack in fall, seed in spring	" 4	" 8	2,310	2,290
14	Subsurface pack in spring, then seed	" 4	" 8	2,330	2,790
15	Subsurface pack in spring, after seeding	" 4	" 8	2,480	2,680
16	Surface pack in fall, seed in spring	" 3	" 8	2,330	2,750
17	Surface pack in spring, then seed	" 3	" 8	2,350	2,610
18	Surface pack in spring after seeding	" 3	" 8	2,280	2,680
19	Combination pack in fall, seed in spring	" 3	" 8	2,550	2,730
20	Combination pack in spring, then seed	" 3	" 8	2,680	2,760
21	Combination pack in spring after seeding	" 3	" 8	2,700	2,780
22	No packer, harrow, seed	" 4	" 8	2,430	2,770
23	Surface pack in fall, seed, surface pack	" 2	" 7	2,570	2,670
24	Subsurface pack in fall, seed, subsurface pack	" 3	" 7	2,640	2,760
25	Combination pack in fall, seed, combination pack	" 2	" 7	2,540	2,860

DEPTH OF SEEDING.

This experiment was tried with wheat on summer-fallow. The wheat was sown April 28, at the rate of 1⅝ bushels per acre. It came up on all plots May 5, headed out June 24 and ripened August 9.

Depths of Seeding Wheat.

Plot No.	Depths sown.	Yield of wheat per acre, 1913.	
		Grain.	Straw.
		Lb.	Lb.
1	Sowing 1 inch deep	2,530	3,710
2	Sowing 2 inches deep	3,030	4,130
3	Sowing 3 inches deep	3,120	4,000
4	Sowing 4 inches deep	2,960	4,000

This experiment was also tried with oats on wheat stubble. The land was ploughed in October, 1912. The oats were sown May 7, 1913 at the rate of 2¾ bushels per acre. They came up May 23, headed out July 9 and ripened August 14..

Depths of Seeding Oats.

Plot No.	Cultural Method.	Yield of oats per acre, 1913.	
		Grain.	Straw.
		Lb.	Lb.
1	Sowing 1 inch deep	3,470	3,170
2	Sowing 2 inches deep	3,600	3,280
3	Sowing 3 inches deep	3,160	3,040
4	Sowing 4 inches deep	2,910	2,690

EXPERIMENTAL FARM FOR SOUTHERN SASKATCHEWAN, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT, T. J. HARRISON, B.S.A.,

WEATHER CONDITIONS AND CROP NOTES, 1913.

As climatic conditions affect materially the results of experimental work in Field Husbandry, it has been deemed advisable to give a brief outline of local weather conditions for the season of 1913. The spring opened up comparatively early and the soil was in a tillable condition by April 14. May was fairly dry, which facilitated the early sowing of the crop, all the grain being sown by May 15. In June and July, 8·5 inches of rain fell, giving the crops plenty of moisture at the growing period. This resulted in a rank growth of straw on the summer-fallowed land. August, with the exception of one bad storm which lodged the grain, was dry and bright, ripening the grain early so that it was nearly all harvested before the first of September. September was dry and warm, and the threshing was well advanced before the cold weather came in October.

In the following table there are recorded the temperatures, precipitation and sunshine for the year 1913:—

SOME WEATHER OBSERVATIONS taken at Experimental Farm, Indian Head, 1913.

Month	Temperature F.			Precipitation.			Total Sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	
				Inches.	Inches.	Inches.	Hours.
January	− 6·51	40	−45	....	8	·8	57·9
February	1·50	40	−35	.....	13	1·3	63·1
March	10·58	45	−31	..	11·75	1·175	121·
April	42·63	80	12	·13	....	·13	166·5
May	48·39	90	23	1·20	7	1·90	174·6
June	61·30	88	33	4·73	.....	4·73	224·9
July	61·16	84	38	4·13	...	4·13	285·3
August	61·61	84	41	2·35	.	2·35	245·5
September	53·33	88	26	·55		·55	200·9
October	33·22	73	5	4·87	16	6·47	107·2
November	27·06	53	− 3	...	7·50	·75	99·2
December	17·10	43	−12	...	·50	....	123·2
Total for year				17·96	63·75	24·335	1,869·3

SCOPE OF FIELD HUSBANDRY WORK.

The growing of field crops is no doubt the most important work on the majority of farms in southern Saskatchewan, and in view of this a large portion of our experimental work is devoted to soil and crop management problems. One hundred and fifty acres are used in the testing of crop rotations under field conditions. Twenty acres are occupied by an extensive set of soil cultural experiments. While some of these experiments have not been in operation long enough to give decisive results, others again have already given valuable information. A considerable portion of the Farm is devoted to producing feeds for live stock. In the areas used for this purpose the cost of production of crops is calculated, and varieties that have been giving best results in small plots are tested out in field lots.

YIELDS OF FIELD CROPS.

TOTAL QUANTITIES of Field Crops, Indian Head, 1913.

Crop.	Quantity produced.
Wheat, Registered Marquis	1,348 bushels, 35 pounds.
" Marquis	548 " 40 "
" Red Fife	904 " 10 "
" Prelude	273 " 35 "
" Pioneer	44 "
" Numbered sorts	154 "
Oats, Banner	2,205 "
" Ligowo Swedish	312 "
" Abundance	396 "
Barley, Manchurian	1,671 " 34 "
" O. A. C. No. 21	132 " 19 "
" Canadian Thorpe	247 " 34 "
Flax, Premost	79 " 46 "
Peas, Arthur	350 " 40 "
Hay	74 tons
Corn	90 "
Roots	117 " 1,167 "
Potatoes	342 bushels.

INDIAN HEAD.

YIELDS OF SPRING WHEAT.

Field tests, of the named varieties of wheat, were made on both summer-fallow and stubble-land. The Registered Marquis is the product of a plot sown with Special Registered Marquis supplied by the Dominion Cerealist in 1912. The Marquis is the progeny of seed supplied to the Farm in 1907.

SPRING WHEAT—Average and Total Yields, Indian Head, 1913.

Variety.	Cultivation.	Acres.	Yield per acre.		Total yield.	
			Bush.	Lb.	Bush.	Lb.
Prelude	Fallow	10·00	25	21	253	35
Prelude	"	·75	26	40	20	
Reg. Marq	"	11·00	44	45	492	15
"	"	5·00	47	20	236	40
"	"	3·00	52	43	158	10
Marquis	Stubble	5·00	40	46	203	50
"	"	10·00	32	49	328	10
Reg. Marquis	Fallow	5·50	44	46	329	40
"	"	5·50	42	8	231	50
Red Fife	Stubble	6·00	38	57	237	5
"	Fallow	6·00	43	40	260	
"	"	6·25	37	8	232	5
"	Stubble	6·25	28		175	
Total		80·25			3,058	20

Average yield per acre, 38 bushels 8 pounds.

YIELD OF WINTER WHEAT.

A small field of winter wheat was sown September 10, 1912, but was almost entirely winter killed. A small portion that was sheltered came through in good condition, and was harvested on August 13, 1913, yielding 32 bushels per acre. From the results of tests for a number of years it would seem that winter wheat is not suitable to southern Saskatchewan.

YIELDS OF WINTER RYE.

A field of 1¾ acres was sown to winter rye on September 12, 1912. This came through in good condition and produced a heavy crop of straw. It was harvested July 31, 1913. The yield was 37 bushels 40 pounds. A 10-acre field in Prelude was disced in the fall and sown to winter rye. It was sown on September 5 and came through the winter in good condition. The reason for sowing this fall rye on the Prelude stubble was the presence of wild oats in the previous crop, and it was thought that by seeding with winter rye the grain would be harvested before the wild oats were ripe. The effectiveness of this treatment will be noted and reported on next season.

YIELDS OF OATS.

Three varieties of oats were grown in field lots. These were sown between May 4 and May 7 and were ripe between August 15 and 25.

OATS—Average and Total Yields, Indian Head, 1913.

Variety.	Cultivation.	Acres.	Yield per acre.		Total Yield.
			Bush.	Lb.	Bushels.
Banner	Summer-fallow	5	81	13	497
Banner	Stubble	5½	50	12	277
Banner	Stubble	5½	39	9	216
Banner	Stubble	6	46		276
Ligowo Swedish	Summer-fallow	5	62	13	312
Abundance	Summer-fallow	8	49	19	396
Total		35			1,884

Average yield per acre, 53 bushels 29 pounds.

YIELDS OF BARLEY.

Two varieties of six-row barley and one of two-row barley were sown in field lots on April 30 and May 1. The crop was harvested on August 12 and 13. Manchurian, which is a very promising variety, would have given a considerably larger yield had it not shelled so badly with the winds. This could possibly be remedied to some extent by cutting the barley before it becomes quite ripe.

BARLEY—Average and Total Yields, Indian Head, 1913.

Variety.	Cultivation.	Acres.	Yield per acre.		Total yield.	
			Bush.	Lb.	Bush.	Lb.
Manchurian	Summer-fallow	12	61	35	699	03
Manchurian	Root land	6	55	32	334	
Manchurian	Summer-fallow	6½	55	4	358	01
Manchurian	Summer-fallow	6½	43	8	380	30
O. A. C. No. 21	Summer-fallow	2½	52	46	132	19
Canadian Thorpe	Summer-fallow	5	49	26	247	34
Total		38½			2,051	39

Average yield per acre, 53 bushels 14 pounds.

YIELD OF FLAX.

The Premost variety only is grown in our field lots. It has proven superior to the other sorts under test.

Yield of Flax, Indian Head, 1913.

Variety.	Cultivation.	Date sown.	Date up.	Days to mature.	Length of straw.	Yield of straw per acre.	Yield of grain per acre.	Weight per measured bushel.
					Inches.	Tons.	Bushels.	Lb.
Premost	Summer-fallow.	August 8....	September 3	118	29	1·344	24	54
Premost	Summer-fallow...	August 16...	September 6	113	29	1·344	24	54½

YIELD OF FIELD PEAS.

Early maturity is the most important point in connection with the growing of peas in this district. For this reason only the Arthur variety is grown. Peas sown on sod that is broken and backset the year previous mature earlier than when sown after summer-fallow.

Yield of Field Peas, Indian Head, 1913.

Variety.	Size of pea.	Date sown.	Date ripe.	Days to mature.	Length of straw.	Length of pod.	Yield of straw per acre.	Yield of grain per acre.	Weight per measured bushel.
					Inches.	Inches.	Lb.	Bush Lb	Lb.
Arthur (backsetting).....	Large.	April 23..	Aug. 27...	126	59	2	2,260	37 40	64
Arthur (summer-fallow..	Large.	April 24...	Sept. 10...	139	78	2	1,912	31 31	64

COST OF PRODUCTION OF FIELD CROPS.

At the present time there is considerable controversy as to the cost of producing our farm crops. Three years ago when the rotation work was inaugurated on this Farm, the keeping of data on the cost of production of the different crops was begun. For this, as well as for our rotation work, fixed values are used, schedule of which is given on page 156.

The following table summarizes the cost of production of the more important field crops grown this year:—

Cost of Production of Field Crops, Indian Head, 1913.

Crop.	Acreage.	Soil Preparation.	Cost per acre.	Cost per bushel.	Cost per ton.	Value per acre.	Profit per acre.
			$ c.	Cents.	$ c.	$ c.	$ c.
Wheat	22¾	Summer-fallow	11 87	29·14	.....	35 45	*23 38
Wheat	17½	Stubble land (burnt)	11 59	32·5	.....	30 19	18 60
Wheat	5½	Corn land	12 18	28·8	.....	33 72	21 54
Oats	16	Stubble land (spring ploughed)	11 59	22·1	.....	21 58	9 99
Barley	6	Root land	12 52	22·5	.....	29 47	16 95
Hay	16½	Seeded with nurse crop	6 70	.....	5 19	13 05	6 35
Corn	6	Summer-fallow	14 07	.....	1·26	33 30	*19 23
Roots	5½	Summer-fallow	28 42	.....	1 38	64 20	*35 78

*This does not include the cost of summer-fallowing.

ROTATION OF CROPS.

Southern Saskatchewan is devoted primarily to grain-growing, and wheat has been the only crop grown extensively since the country was first settled. It will no doubt remain the important crop for some years to come because of our location and climatic conditions. But that there must be a change in the system of cropping is admitted by all up-to-date farmers, for the growing of wheat alone and summer-fallowing every third year, is too favourable to the introduction of weeds, the exhaustion of the soil fibre and the depletion of fertility. If the quantity and quality of wheat are to be maintained, loss from these causes must be guarded against. Suitable rotations of crops will do much to minimize these losses. With this in mind, a number of different rotations have been put in operation to test their adaptability to this district. The costs, returns and profits of these rotations are being recorded, and analyses will be made from time to time to gather information as to their effect on soil fertility.

ROTATION "C" (THREE YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat.

This rotation consists of three fields containing 6¼ acres each. In 1913 the entire rotation gave a profit of $9.61 per acre, and the average profit for two years is $6 72 per acre.

This rotation is followed by the majority of farmers in the southern portion of the province. The rainfall being more or less sparse the summer-fallow is necessary to store moisture for the two succeeding crops. The objection to the long-continued use of this rotation is that it tends to exhaust the soil fibre, facilitates the introduction of weeds, and must ultimately deplete fertility.

INDIAN HEAD.

ROTATION "J" (SIX YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat.

Fourth year.—Oats. Seeded down with 8 pounds western rye grass, 4 pounds alfalfa and 4 pounds red clover per acre.

Fifth year.—Hay.

Sixth year.—Pasture.

This was started in 1911 and consists of six fields containing 5 acres each. The profit per acre in 1913 was $12.08. It would seem a rotation well suited to the needs of the farmer at present.

The grass will return fibre to the soil, and as the keeping of live stock is called for, there will be manure to help conserve fertility. The two years hay and pasture followed by summer-fallow will, to a great extent, keep the weeds under control. Seemingly, the greatest objection will be the difficulty, in a dry season, of procuring a good stand of grass with a nurse-crop on second year stubble.

ROTATION "P" (EIGHT YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat.

Fourth year.—Summer-fallow.

Fifth year.—Roots or legumes. Manured 15 tons per acre.

Sixth year.—Barley. Seeded down with rye grass, red clover and alfalfa.

Seventh year.—Hay.

Eighth year.—Pasture.

This was started in 1911 and consists of eight fields containing 6 acres each. In 1913 the profit per acre was $8.19. A rotation of this nature is adapted to a stock-raising district and will not be followed to any extent, locally, for some years. But as the weeds become more prevalent this, or a similar, rotation will have to be adopted, because there are six years out of the eight under crop and cultivation suitable for the eradication of weeds. The chief objection of applying it to the average farm at present is the small amount of grain and the large amount of hoed crop.

ROTATION "R" (NINE YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Hoed crops or legumes. Manured 15 tons per acre.

Third year.—Wheat.

Fourth year.—Oats.

Fifth year.—Summer-fallow.

Sixth year.—Wheat.

Seventh year.—Oats. Seeded down with rye grass, red clover and alfalfa.

Eighth year.—Hay.

Ninth year.—Pasture.

This rotation was started in 1910 and consists of nine fields of 5½ acres each. In 1913 a profit of $9.45 per acre was received. As this is very similar to rotation "P" much the same criticism will apply.

In order to determine the profits from these rotations fixed values are used from year to year, as given on page 156 of this report.

ROTATION

Tabulated details are as follows:—

Rotation Year.	Crops 1912.	Crops 1913.	Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Horse labour (including teamster). Hours. Single horse	2-horse team	3-horse team	4-horse team	5-horse team
			Ac.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
3rd.	Wheat	Wheat	6¼	12 50	20 54	9	1 71		4	35		
1st	Wheat	Summer-fallow	6¼	12 50	3 75					36		
2nd.	Summer-fallow	Wheat	6¼	12 50	20 54	16½	3 14		9	28¾		
	Aggregate		18¾	37 50	44 83	25½	4 85		13	99¾		
	Average per acre, 1913			2 00	2 39	1·3	0 25		·7	5·3		

ROTATION

2nd.	Summer-fallow	Wheat	5	10 00	16 19	17	3 23		14	23		
3rd.	Wheat	Wheat	5	10 00	16 19	12	2 28		4	29		
4th.	Wheat	Oats	5	10 00	15 19	16	3 04		6	34½		
5th.	Wheat	Hay	5	10 00	10 55	16½	3 14		13½			
6th.	Wheat	Pasture	5	10 00	7 55							
1st.	Wheat	Summer-fallow	5	10 00	3 00					44½		
	Aggregate		30	60 00	68 67	61½	11 69		37½	130¾		
	Average per acre, 1913			2 00	2 29		0 39					

ROTATION

4th.	Wheat	Oats	5½	20 16	16 70	13½	2 57		6¾	16½		
5th.	Oats	Summer-fallow	5½	20 16	3 30	15	2 85			29½		
6th.	Summer-fallow	Wheat	5½	20 16	18 09				9	19¼		
7th.	Wheat	Oats	5½	20 16	16 70	16¼	3 09		4½	21¼		
8th.	Oats	Hay	5½	20 16	11 60	10	1 90	2	15			
9th.	Hay	Pasture	5½	20 16	8 31							
1st.	Pasture	Summer-fallow	5½	20 16	3 30					24½		
2nd.	Summer-fallow	Roots	5½	20 16	5 81	449	85 32	24	104	7¾		
3rd.	Corn	Wheat	5½	20 16	18 09	17	3 23		3¾	19		
	Aggregate		49·5	181 44	101 90	520½	98 96	26	143	137¾		
	Average per acre, 1913			3 67	2 06		1 99					

ROTATION

3rd.	Wheat	Wheat	6	23 25	19 73	14	2 66		12	36½		
4th.	Wheat	Summer-fallow	6	23 25	3 60					70½		
5th.	Summer-fallow	Corn	6	23 25	12 23	78½	14 92	21½	62½	17		
6th.	Roots	Barley	6	23 25	21 23	33½	6 37		7½	27¾		
7th.	Barley	Hay	6	23 25	12 66	9	1 71	4¼	15			
8th.	Hay	Pasture	6	23 25	9 06							
1st.	Pasture	Summer-fallow	6	23 25	3 60					60¾		
2nd.	Summer-fallow	Wheat	6	23 25	19 73	18	3 42		10	26		
	Aggregate		48	186 00	101 84	153	29 08	25¾	107	238½		
	Average per acre, 1913			3 87	2 12		0 60½					

"C" (three years' duration).

IN RAISING CROP.						PARTICULARS OF CROP.							
							Weight.						
Value of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of Stubble.	Grain.	Straw.	Hay.	Hoed crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
15 71	12 25	62 71	10 03	35·8	.....	6	10,500	11,176	.....	.....	145 59	23 29	13 26
14 76	.....	31 01	4 96	.....	.....	.....	.....	.....	.....	.....	.....	.....	−4 96
14 85	14 58	75 61	10 49	32·5	.....	6	13,925	16,384	.....	.....	193 86	31 01	20 52
45 32	26 83	159 33	.....	.....	.....	.....	.....	.....	.....	.....	339 45	.....	.....
2 41	1 43	.....	8 49	.....	.....	.....	.....	.....	.....	.....	.....	18 10	9 61

"J" (six years' duration).

14 19	16 54	60 15	12 03	25·4	.....	6	14,200	17,328	.....	.....	197 99	39 59	27 56
13 25	14 27	55 99	11 20	27·4	.....	6	12,230	15,328	.....	.....	170 73	34 15	22 95
16 08	16 28	60 59	12 12	14·8	.....	6	13,838	16,178	.....	.....	154 55	30 91	18 79
4 59	.....	28 28	5 66	.....	.....	.....	.....	.....	13,110	.....	65 55	13 11	7 45
.....	.....	17 55	3 51	.....	.....	.....	.....	.....	.....	.....	27 50	5 50	1 99
18 25	.....	31 25	6 25	.....	.....	.....	.....	.....	.....	.....	.....	.....	−6 25
66 36	47 09	253 81	.....	.....	.....	.....	.....	.....	.....	.....	616 32	.....	.....
2 21	1 57	.....	8 46	.....	.....	.....	.....	.....	.....	.....	.....	20 54	12 08

"R" (nine years' duration).

9 07	10 91	59 41	10 80	21·4	.....	6	9,418	10,540	.....	.....	104 72	19 04	8 24
12 10	.....	38 41	6 98	.....	.....	.....	.....	.....	.....	.....	.....	.....	−6 98
10 95	16 08	65 28	11 87	28·4	.....	6	13,780	17,600	.....	.....	192 53	35 00	23 13
10 24	15 12	65 31	11 87	30	.....	6	7,344	7,964	.....	.....	81 40	14 80	2 93
5 64	.....	39 30	7 14	.....	.....	.....	.....	.....	13,880	.....	73 22	13 31	6 17
.....	.....	28 47	5 17	.....	.....	.....	.....	.....	.....	.....	30 27	5 50	0 33
10 05	.....	33 51	6 09	.....	.....	.....	.....	.....	.....	.....	.....	.....	−6 09
45 02	.....	156 31	28 42	.....	.....	.....	.....	.....	.....	235,167	353 14	64 20	35 78
9 28	16 23	66 99	12 18	28·8	.....	6	13,910	17,820	.....	.....	185 47	33 72	21 54
112 35	58 34	552 99	.....	.....	.....	.....	.....	.....	.....	.....	1,020 75	.....	.....
2 27	1 18	.....	11 17	.....	.....	.....	.....	.....	.....	.....	.....	20 62	9 45

"P" (eight years' duration).

19 05	16 60	81 29	13 55	34·3	.....	6	14,225	18,450	.....	.....	198 90	33 15	19 60
28 91	.....	55 76	9 29	.....	.....	.....	.....	.....	.....	.....	.....	.....	−9 29
34 03	.....	84 43	14 07	.....	.....	.....	.....	.....	.....	1,332,000	199 80	33 30	19 23
13 93	16 70	81 48	13 58	24·4	.....	6	16,032	16,500	.....	.....	176 82	29 47	15 89
6 25	.....	43 87	7 31	.....	.....	.....	.....	.....	15,260	.....	76 30	12 72	5 41
.....	.....	32 31	5 38	.....	.....	.....	.....	.....	.....	.....	33 00	5 50	0 12
24 91	.....	51 76	8 66	.....	.....	.....	.....	.....	.....	.....	.....	.....	−8 66
14 06	18 20	78 66	13 11	30·2	.....	6	15,600	19,628	.....	.....	217 81	36 30	23 19
141 14	51 50	509 56	.....	.....	.....	.....	.....	.....	.....	.....	902 63	.....	.....
2 94	1 07	.....	10 61	.....	.....	.....	.....	.....	.....	.....	.....	18 80	8 19

INDIAN HEAD.

The following brief summary records the chief items in the rotations tabled in detail above.

Cost of Operations, Value of Products, and Profits of Rotation "C," "J," "P" and "R."

Rotation.	Area.	Total cost to operate.	Total value of products.	Profit per acre.
	Acres.	$ cts.	$ cts.	$ cts.
"C" (3 years' duration)	18¾	159 33	339 45	9 61
"J" (6 years' duration)	30	253 81	616 32	12 08
"P" (8 years' duration)	48	509 56	902 63	8 19
"R" (9 years' duration)	49½	552 99	1,020 75	9 45

SOIL CULTURAL EXPERIMENTS.

DEPTH OF PLOUGHING SUMMER-FALLOW TO BE SOWN TO WHEAT.

The land in this experiment was ploughed in June for summer-fallow at depths varying from 3 to 8 inches and from 5 to 8 inches with a 4-inch subsoiling.

No conclusions can be reached from the results of only two years' work along this line, but it might be pointed out that this year the plot ploughed 6 inches deep shows a slight advantage in yield over any of the others.

Depth of Ploughing Summer-fallow to be Sown to Wheat.

Plot No.	Depth of ploughing summer-fallow, 1912.	Days to mature.	Yield of wheat per acre, 1913.	
			Bush.	Lb.
1	Ploughing 3 inches deep	131	32	00
2	Ploughing 4 inches deep	131	38	40
3	Ploughing 5 inches deep	131	36	00
4	Ploughing 6 inches deep	131	42	00
5	Ploughing 7 inches deep	131	36	40
6	Ploughing 8 inches deep	131	36	00
7	Ploughing 5 inches deep and subsoiling 4 inches	131	34	00
8	Ploughing 6 inches deep and subsoiling 4 inches	131	38	00
9	Ploughing 7 inches deep and subsoiling 4 inches	131	40	00
10	Ploughing 8 inches deep and subsoiling 4 inches	131	38	00

DEPTH OF PLOUGHING WHEAT STUBBLE TO BE SOWN TO OATS.

The wheat stubble of 1912, in the above experiment, was ploughed as in the table below for oats. The deep ploughing and subsoiling in preparation for the wheat crop preceding oats, seems to have had a favourable effect on the latter crop as will be noted in the table of results given herewith.

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DEPTH OF PLOUGHING Wheat Stubble to be sown to Oats.

Plot No.	Depth of ploughing summer-fallow for wheat, 1911.	Depth of ploughing wheat stubble fall of 1912.	Days to mature.	Yield of oats per acre, 1913.	
				Bush.	Lb.
1	Ploughed 3 inches.....	Ploughed 5 inches deep	113	64	24
2	" 4 "	" 4 "	113	58	26
3	" 5 "	" 5 "	115	58	26
4	" 6 "	" 5 "	115	64	24
5	" 7 "	" 5 "	115	68	08
6	" 8 "	" 5 "	115	75	10
7	Ploughed 5 inches, subsoiled 4 inches.....	" 5 "	115	76	24
8	Ploughed 6 inches, subsoiled 4 inches.....	" 5 "	115	78	28
9	Ploughed 7 inches, subsoiled 4 inches.....	" 5 "	115	67	2
10	Ploughed 8 inches, subsoiled 4 inches.....	" 5 "	115	95	10

While it is possible that the above tests have not been running long enough to give decisive data, this season's work would seem to indicate that while deep ploughing did not always give noticeable increases the first season, it did increase the yield the second season. The ploughing of summer-fallow should be at least 6 inches deep and fall ploughing for oats 5 inches.

DEPTH OF PLOUGHING SOD.

This experiment is being conducted in a four-year rotation of:—

First year.—Wheat.

Second year.—Oats. Seeded down.

Third year.—Hay.

Fourth year.—Hay.

The sod was ploughed 3, 4 and 5 inches deep in preparation for wheat, and the wheat stubble, 3, 4, 5 and 6 inches deep in preparation for oats.

DEPTH OF PLOUGHING Sod to be sown to Wheat followed by Oats.

Plot No.	Depth of ploughing sod, 1912.	Days to mature.	Yield of wheat per acre on sod.	Depth of ploughing wheat stubble for oats.	Days to mature.	Yield of oats per acre on wheat stubble.
			Lb.			Lb.
1	Ploughing 3 inches deep...	105	1,240	Ploughing 3 inches deep.	115	1,640
2	Ploughing 4 inches deep...	105	1,560	Ploughing 4 inches deep.	115	1,800
3	Ploughing 5 inches deep...	105	1,280	Ploughing 5 inches deep.	115	1,800
4	Ploughing 3 inches deep...	105	1,240	Ploughing 6 inches deep.	115	1,800

INDIAN HEAD.

SUMMER-FALLOW TREATMENT.

The rotation used by the majority of farmers in southern Saskatchewan is:—

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat or oats.

This means that one-third of the farm is in summer-fallow each season, consequently information as to the best methods of summer-fallowing is of vital importance. An experiment including fifteen different kinds of treatment was started in 1911. As climatic conditions will affect the yield materially, the average results for a number of years are necessary before deductions may be made. The table below outlines the different methods of cultivation and shows the yields of wheat as a result thereof. The yields of oats following the wheat are also given. It will be noted that the plot ploughed four inches deep in June, cultivated and ploughed 4 inches deep again in September gave best returns. The only other method that yielded nearly so high was the land that was fall disced before summer-fallowing, ploughed 6 inches deep in June, harrowed and packed as necessary. It must be remarked, however, that with the latter method weeds are under better control and the crop of oats following the wheat has surpassed all the others, so that, all things considered, it may be regarded as the most generally satisfactory treatment.

TREATMENT OF SUMMER-FALLOW to be sown to Wheat followed by Oats.

Plot No.	Treatment of summer-fallow, 1912.	Days to mature.	Yield of wheat per acre on summer-fallow.		Yield of oats per acre following wheat.	
			Bush.	Lb.	Bush.	Lb.
1	Plough 4 inches June, pack if necessary and practicable, cultivate as necessary	124	23	20	72	32
2	Plough 6 inches June, pack if necessary and practicable, cultivate as necessary	127	34	40	76	16
3	Plough 8 inches June, pack if necessary and practicable, cultivate as necessary	127	36	40	71	26
4	Plough 4 inches June, cultivate. Plough 4 inches September, harrow	127	40	00	76	16
5	Plough 6 inches June, cultivate. Plough 6 inches September, harrow	127	29	20	68	08
6	Plough 8 inches June, cultivate. Plough 8 inches September, harrow	127	36	00	67	02
7	Plough 6 inches June, cultivate. Plough 4 inches September, harrow	127	38	40	76	16
8	Plough 4 inches June, cultivate. Plough 6 inches September, harrow	127	36	20	54	04
9	Plough 4 inches June, early as possible, cultivate. Plough 6 inches September, leave untouched	127	38	00	67	02
10	Plough 5 inches June, seed to rape or other green forage crop and pasture off	127	26	40	69	14
11	Plough 6 inches May 15, harrow and pack if necessary, cultivate as necessary	127	37	20	72	32
12	Plough 6 inches June 15, harrow and pack if necessary, cultivate as necessary	127	35	20	62	12
13	Plough 6 inches July 15, harrow and pack if necessary, cultivate as necessary	127	35	20	81	06
14	Fall cultivate before summer-fallowing. Plough 6 inches June, harrow and pack if necessary, cultivate as necessary	127	38	40	82	12
15	Fall plough 4 inches, before summer-fallowing. Plough 6 inches June, harrow and pack if necessary, cultivate as necessary	127	38	00	76	16
16	Plough 6 inches June, pack, cultivate as necessary	127	36	40	76	16
17	Plough 6 inches June, no packing, otherwise same as other plots	127	36	00	82	12

STUBBLE TREATMENT.

An experiment including ten different methods of stubble treatment has been running for two years. The indications are that the method calculated to conserve the moisture will give the highest yield. Fall ploughing and subsurface packing at once proved the most satisfactory method in the test just completed.

TREATMENT OF WHEAT STUBBLE to be sown to Wheat.

Plot No.	Treatment given wheat stubble preceding wheat.	Days to mature.	Yield of wheat per acre, 1913.	
			Bush.	Lb.
1	Plough autumn	128	13	20
2	Disc harrow autumn	128	14	40
3	Burn stubble, then disc autumn	128	18	00
4	Burn stubble, then plough autumn	127	24	00
5	Burn stubble in spring, seed at once	128	24	00
6	Plough in spring, seed at once	128	27	20
7	Disc at cutting time, spring plough	128	23	20
8	Disc at cutting time, autumn plough	128	20	00
9	Plough autumn, subsurface pack at once	128	30	00
10	Plough spring, seed, subsurface pack	128	26	40

TREATMENT OF WHEAT STUBBLE to be sown to Oats.

Plot No.	Treatment given wheat stubble preceding oats.	Days to mature.	Yield of oats per acre, 1913.	
			Bush.	Lb.
11	Plough autumn, subsurface pack at once	115	60	00
12	Plough spring, seed, subsurface pack	115	77	32
13	Cultivate autumn, spring plough, seed	115	83	18

SEEDING TO GRASS AND CLOVER.

As interest grows in mixed farming the different methods of seeding down to grasses and clovers become a more important consideration.

In 1911 an experiment was begun to determine the best preceding crops and soil preparation for seeding to western rye grass and red clover. The results of only one test are as yet available. They are as follows:—

Seeding to Grass and Clover.

Plot No.	Method of seeding.	Yield of first year hay.	
		Tons.	Lb.
1	Seeding rye grass 10 lb. and red clover 10 lb. with nurse crop on summer-fallow	4	1,440
2	Seeding rye grass 10 lb. and red clover 10 lb. alone after summer-fallow	4	1,660
3	Seeding rye grass 10 lb. and red clover 10 lb. with nurse crop on first year after hoed crop	5	600
4	Seeding rye grass 10 lb. and red clover 10 lb. alone after hoed crop	4	840
5	Seeding rye grass 10 lb. and red clover 10 lb. with nurse crop on first year wheat stubble	3	1,400
6	Seeding rye grass 10 lb. and red clover 10 lb. alone after first year wheat	3	1,760
7	Seeding rye grass and red clover with oats to cut green, on first year wheat stubble	3	400
8	Seeding rye grass 10 lb. and red clover 10 lb. alone on first year wheat stubble, manured 8 tons per acre, ploughed preceding fall	4	400
9	Seeding rye grass 10 lb. and red clover 10 lb. with nurse crop on second year wheat stubble	4	280
10	Seeding rye grass 10 lb. and red clover 10 lb. alone after second year grain oats	4	520
11	Seeding rye grass 10 lb. and red clover 10 lb. with nurse crop on second year after hoed crop	3	80

APPLICATION OF BARNYARD MANURE.

Southern Saskatchewan is a comparatively newly-settled country, and the problem of conserving soil fertility has not as yet forced itself upon us. In the older districts, however, where wheat growing has been followed year after year, yields are commencing to show a falling off and the need of methods for conserving fertility and restoring fibre is indicated. Probably the cheapest way of returning plant food and vegetable matter to the soil is by the use of barnyard manure. In order to learn something as regards how and when manure may be most advantageously applied the following experiments have been incepted.

Application of barnyard manure for corn and roots.

Corn was used in the test of 1913. In plots 1 to 7 wheat is grown two years in succession following corn; in plots 8 and 9 the rotation is corn, wheat, summer-fallow. The following table indicates the yield and value of the crops from the entire rotation. Corn is valued at $3 per ton and wheat at 80 cents per bushel:—

Application of Barnyard Manure for Corn.

Plot No.	Application of manure.	Yield of corn per acre, 1913.		Yield of wheat per acre following corn, 1912.		Yield of wheat per acre following wheat, 1912		Value of crops per acre for entire rotation.	
		Tons.	Lb.	Bush.	Lb.	Bush.	Lb.	$	c.
1	No manure, plough second-year stubble in in autumn	11	1040	25	00	14	40	22	10
2	Apply in autumn after ploughing second-year stubble, work in at once	12	960	23	20	12	00	21	90
3	Apply in spring, on autumn ploughed second-year stubble, work in at once	11	800	20	00	18	00	21	53
4	Apply in autumn on second-year stubble, plough under in autumn	10	1890	18	40	16	00	20	19
5	Apply in spring on second-year stubble, plough under in spring	11	80	24	40	14	00	21	35
6	Apply in winter on second-year stubble, plough under in spring	12	960	26	40	16	40	24	03
7	Apply in winter green manure (cut straw) on second-year stubble, plough under in spring	13	1070	22	00	16	00	23	67
8	Apply in winter green manure (cut straw) on summer-fallow, disc in	11	1920	30	40	Summer-fallow		20	14
9	Summer-fallow, no manure	15	1200	42	40	"		26	98

Application of barnyard manure for wheat.

In this experiment there is followed a rotation of summer-fallow, wheat, wheat. In the case of plots 2 and 4 the manure is applied to affect the wheat crop after summer-fallow, whereas in the remaining plots it is applied to affect the second wheat crop of the rotation. To make a fair comparison of the different methods of application it is therefore necessary to average the yields for the two crop producing years of the rotation.

Application of Barnyard Manure for Wheat.

Plot No.	Application of manure.	Yield of wheat per acre on wheat stubble.		Yield of wheat per acre on summer-fallow.		Average yield of wheat per acre for entire rotation.	
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
1	Apply in winter green manure (cut straw) on first-year stubble, disc in	16	40	34	00	25	20
2	Apply in winter green manure (cut straw) on summer-fallow, disc in	17	20	42	00	29	40
3	Top dress, with spreader, grain sown on first-year stubble	20	00	39	20	29	40
4	Top dress, with spreader, grain sown on summer-fallow	16	40	40	00	28	20
5	No manure, plough first-year stubble in autumn	16	40	38	00	27	20
6	Apply on first-year stubble, plough under in autumn	26	00	38	40	32	20
7	Apply on first-year stubble, plough under in spring	19	20	38	00	28	40
8	No manure, disc first-year stubble in autumn	20	00	38	00	29	00
9	No manure, burn first-year stubble	34	00	38	40	36	20

Application of barnyard manure for barley.

In this experiment a three-year rotation has been adopted:—

First year.—Summer-fallow.

Second year.—Wheat, or barley where indicated.

Third year.—Barley, or oats where indicated. Where barley follows summer-fallow oats follow barley.

Owing to the different cropping systems followed a comparison of all the methods of application is somewhat difficult. Plots 2 and 4, in which barley is sown on summer-fallow and followed by oats, must be considered apart from the remaining plots where barley is sown on wheat stubble which follows summer-fallow. Barley and oats are valued at 1 cent and wheat at 1⅓ cents per pound and the average value per acre of the two crops taken so that the comparison of the different methods of application may be more clearly set forth.

Application of Barnyard Manure for Barley.

Plot No.	Application of manure.	Yield of wheat per acre on summer-fallow.	Yield of barley per acre on wheat stubble.	Value per acre of crops for entire rotation.
		Lb.	Lb.	$ c.
1	Apply in winter green manure (cut straw) on first-year stubble, disc in	2040	1280	29 00
3	Top dress, with spreader, barley sown on first-year stubble	2240	1760	23 73
5	No manure, plough first-year stubble in autumn	2360	2000	25 73
6	Apply on first-year stubble, plough under in autumn	3000	2000	30 00
7	Apply on first-year stubble, plough under in spring	2520	1840	26 00
8	No manure, disc first-year stubble in autumn	2320	1720	24 06
9	No manure, burn first-year stubble	2320	1800	24 46

Application of Barnyard Manure for Barley.

Plot No.	Application of manure.	Yield of barley per acre on summer fallow	Yield of oats per acre on barley stubble	Value of crops per acre for entire rotation
		Lb.	Lb.	$ c
2	Apply in winter green manure (cut straw) on summer-fallow, sow barley on summer-fallow	1,560	2,440	20 00
4	Top dress, with spreader, barley sown on summer fallow	2,080	1,920	19 60

Application of barnyard manure for oats.

In this experiment a three-year rotation is being followed:—

First year.—Summer-fallow.

Second year.—Wheat, or oats where indicated.

Third year.—Oats, or barley where indicated.

As in the previous experiment the different cropping systems followed make it necessary to consider plots 2 and 4 apart from the remaining plots and to average the value of both crops of the rotation in order to make a clear comparison of the different methods of applying manure. Oats and barley are valued at one cent and wheat at 1⅓ cents per pound.

Application of Barnyard Manure for Oats.

Plot No.	Application of manure.	Yield of wheat per acre on summer fallow.	Yield of oats per acre on wheat stubble	Average value of crops per acre for entire rotation
		Lb.	Lb.	$ c.
1	Apply in winter green manure (cut straw) on first-year stubble, disc in	2,040	2,560	26 40
3	Top dress, with spreader, oats sown on first-year stubble	2,560	2,520	29 66
5	No manure, plough first-year stubble in autumn	2,320	2,560	29 46
6	Apply on first-year stubble, plough under in autumn	2,440	2,600	29 26
7	Apply on first-year stubble, plough under in spring	2,520	2,800	30 80
8	No manure, disc first-year stubble in autumn	2,640	3,360	34 40
9	No manure, burn first-year stubble	2,160	3,200	30 40

Application of Barnyard Manure for Oats.

Plot No.	Application of manure.	Yield of oats per acre on summer fallow	Yield of barley per acre on oat stubble.	Average value of crops for entire rotation
		Lb.	Lb.	$ c.
2	Apply in winter green manure (cut straw) on summer-fallow, sow oats on summer-fallow	2,040	1,160	16 00
4	Top dress, with spreader, oats sown on summer-fallow	2,440	1,760	21 00

GREEN MANURING.

Where barnyard manure is not available and the soil has become depleted of its fertility it is often desirable to plough under some green crop. If this crop is a legume so much the better, as nitrogen will then be added.

In the experiment tabulated below peas and tares are used as green crops and their value is being compared to a bare summer-fallow, and summer-fallow with manure. Oats are valued at one cent and wheat at 1⅓ cents per pound.

GREEN MANURING for Wheat followed by Oats.

Plot No.	Treatment of land year previous to wheat.	Yield of wheat per acre.	Yield of oats per acre on wheat stubble	Value of crops per acre for entire rotation
		Lb.	Lb.	$ c.
1	Summer-fallow	2,240	2,120	25 53
2	Peas, ploughed under early in July	2,320	2,080	25 86
3	Peas, ploughed under when in bloom	2,120	2,200	25 13
4	Tares, ploughed under late July	2,120	2,240	25 33
5	Summer-fallow, barnyard manure 12 tons per acre applied on summer-fallow	2,400	2,360	27 80
6	Summer-fallow	1,800	2,380	25 90

SEED-BED PREPARATION.

There is a great tendency, more especially in the newly-settled districts of Saskatchewan, to endeavour to seed a large acreage, often at the expense of the soil preparation. In order to learn to what extent careful preparation of the seed-bed for grain is actually profitable an experiment has been inaugurated in which the seed-bed for wheat and oats is prepared to three different degrees of perfection.

With the exception of one case, which is rather difficult to explain, the "good" and "extraordinary" treatments have greatly increased yields over the "poor" treatment.

PREPARATION of Seed Bed for Wheat.

Plot No.	Preparation given.	Yield of wheat per acre, 1913.	
		Bush.	Lb
1	"Poor" (harrowed only once)	12	00
2	"Good" (harrowed twice)	20	40
3	"Extraordinary" (harrowed three times and packed)	34	00

PREPARATION of Seed Bed for Oats.

Plot No.	Preparation given.	Yield of oats per acre, 1913.	
		Bush.	Lb.
1	"Poor" (harrowed twice)	80	18
2	"Good" (harrowed three times)	71	26
3	"Extraordinary" (harrowed four times and packed)	75	10

SOIL PACKERS.

The soil packer being a comparatively new type of implement, the effect of its use is not widely known. In order to determine whether or not results justify its purchase, and if so, which type to buy and when to apply it, an experiment involving seventy-five plots was begun in 1911.

INDIAN HEAD.

In the table of results presented below it will be noted that after ploughing for summer-fallow the application of the sub-surface packer greatly increased yields. Of the three different methods of packing after seeding in the spring the surface packer this year gave best results.

Harrowing the grain after it was up about six inches produced a higher yield than rolling or packing it at that period of growth.

Soil Packing for Wheat following Summer-fallow.

Plot No.	Cultural treatment given.		Days to mature.	Yield of wheat per acre, 1913. Bush.	Lb.
1	Harrow, seed	Spring work when seeding.	129	41	20
2	" " surface pack		129	45	20
3	" " " harrow		129	40	40
4	" " subsurface pack		129	40	00
5	" " " harrow		129	41	20
6	" " combination pack		129	42	00
7	" " " harrow		129	47	20
8	Surface pack, seed, surface pack		129	45	20
9	Subsurface pack, seed, subsurface pack		129	49	20
10	Combination pack, seed, combination pack		129	45	20
11	Surface pack, harrow, seed		129	51	00
12	Subsurface pack, harrow, seed		129	52	40
13	Combination pack, harrow, seed		129	52	00
14	Harrow, seed		129	48	40
15	Plough for summer-fallow, surface pack, cultivate; next spring, smoothing harrow, seed		129	49	20
16	Plough for summer-fallow, subsurface pack, cultivate; next spring, smoothing harrow, seed		129	51	20
17	Plough for summer-fallow, combination pack, cultivate; next spring, smoothing harrow, seed		129	46	40
18	Plough for summer-fallow, surface pack, cultivate; next spring, smoothing harrow, seed, surface pack		129	42	40
19	Plough for summer-fallow, subsurface pack, cultivate; next spring, smoothing harrow, seed, subsurface pack		129	54	00
20	Plough for summer-fallow, combination pack, cultivate; next spring, smoothing harrow, seed, combination pack		129	45	20
21	Harrow, seed	Spring work when seeding.	129	47	20
22	" " harrow when 6 inches high		129	46	40
23	" " surface pack when 6 inches high		129	43	20
24	" " roll when 6 inches high		129	40	00
25	" "		129	42	40

Soil Packing for Wheat sown on Spring Ploughed Stubble Land.

Plot No.	Cultural treatment given.	Days to mature.	Yield of wheat per acre, 1913. Bush.	Lb.
1	Harrow, subsurface pack, harrow, seed	133	29	20
2	Harrow, surface pack, harrow, seed	133	41	20
3	Harrow, combination pack, harrow, seed	133	43	20
4	Harrow, subsurface pack, harrow, seed, subsurface pack	133	34	00
5	Harrow, surface pack, harrow, seed, surface pack	133	42	40
6	Harrow, combination pack, harrow, seed, combination pack	133	34	40
7	Harrow, seed, harrow	133	29	20
8	Harrow, seed, surface pack	133	30	00
9	Harrow, seed, subsurface pack	133	34	00
10	Harrow, seed, combination pack	133	32	40
11	Harrow, seed	133	27	20

Soil Packing for Wheat sown on Fall Ploughed Stubble Land.

Plot No.	Cultural treatment given.	Days to mature.	Yield of wheat per acre, 1913.	
			Bush.	Lb.
12	No packer, harrow, seed	133	24	40
13	Subsurface pack in fall, seed in spring	133	17	20
14	Subsurface pack in spring, then seed	133	18	40
15	Subsurface pack in spring, after seeding	133	20	40
16	Surface pack in fall, seed in spring	133	24	40
17	Surface pack in spring, then seed	133	23	20
18	Surface pack in spring, after seeding	133	19	20
19	Combination pack in fall, seed in spring	133	28	00
20	Combination pack in spring, then seed	133	29	40
21	Combination pack in spring, after seeding	133	32	00
22	No packer, harrow, seed	133	26	00
23	Surface pack in fall, seed, surface pack	133	27	20
24	Subsurface pack in fall, seed, subsurface pack	133	26	00
25	Combination pack in fall, seed, combination pack	133	22	40

DEPTH OF SEEDING.

Oats and wheat were sown at depths varying from 1 to 4 inches. In each case there were remarkable differences in the yields. It would seem that the best results are obtained when wheat is sown from two to three inches deep and oats from three to four inches deep.

Depths of Seeding Wheat.

Plot No.	Depths sown.	Days to mature.	Yield of wheat per acre, 1913.	
			Bush.	Lb.
1	Sowing 1 inch deep	132	43	20
2	Sowing 2 inches deep	132	44	40
3	Sowing 3 inches deep	132	44	20
4	Sowing 4 inches deep	132	37	40

DEPTHS of Seeding Oats.

Plot No.	Depths sown.	Days to mature.	Yield of oats per acre, 1913.	
			Bush.	Lb.
1	Sowing 1 inch deep	113	65	30
2	Sowing 2 inches deep	113	72	32
3	Sowing 3 inches deep	113	77	22
4	Sowing 4 inches deep	113	78	28

SPLIT LOG DRAG.

The value of the plank drag has been well demonstrated at this Farm. The roads are drag harrowed as soon as they start to dry after a rain. This levels them down and keeps them from rutting. As soon as they are dry enough to work nicely the road drag is put on which has the effect of rounding them up. In the dry weather the road drag is put on once a week. By following this system the grader is not used to any extent.

EXPERIMENTAL STATION FOR CENTRAL SASKATCHEWAN, ROSTHERN, SASK.

REPORT OF THE SUPERINTENDENT, WM. A. MUNRO, B.A., B.S.A.

WEATHER CONDITIONS, 1913.

The precipitation was lower in 1913 than in 1911 or 1912, but was more evenly distributed throughout the season. This produced a much more uniform growth in the grain crops than occurred in 1912. Coupled with this was the fact that in 1913 there were no severe frosts until September 20, which allowed the grain to mature fully. The grain of 1913 was therefore of a superior grade.

There was the least snowfall in 1913-14 of any season since the establishment of the Station, in 1909.

A severe hailstorm damaging an area 2 miles wide and more than 30 miles long, passed within half a mile of the north boundary of the Station on July 25. The crops within the range of this storm were a total loss. On September 5 lightning struck and burned a shock of oats at a distance of 400 feet from the Superintendent's residence.

Seeding began on April 17, haying on July 21 and the harvesting of grain on August 13. The ground was frozen preventing further cultivation on October 27.

Following is the weather record for the year:—

Month.	Temperature F.			Precipitation.			Heaviest in 24 hours.	Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.		
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	38·6	−49·5	−13·3	.....	5·5	0·55	·20	73·9
February	35·0	−34·0	— 0·6	.....	5·0	0·50	·25	103·8
March	41·1	−33·8	4·25	.....	3·5	0·35	·20	160·3
April	72·2	14·8	40·45	·23	0·3	0·26	·13	203·0
May	78·7	22·1	46·3	1·26	.....	1·26	·15	227·9
June	85·7	35·0	59 2	1·87	.....	1·87	·48	234·7
July	84·1	39·7	59·4	3·80	.....	3·80	1·26	289·2
August	82·1	39·7	60·0	3·59	.....	3·59	1·47	248·7
September	84·1	29·7	50·6	2·89	.....	2·89	1·48	231·5
October	69·0	0·7	32·1	.....	2·9	·29	·18	126·4
November	52·9	— 3·9	22·45	·09	2·5	·34	·25	109·9
December	33·0	−21·8	12·59	.....	.....	.....	.....	109·5
Total for year	.....	.....	.....	13·73	19·7	15·70	.....	2,118·8
Average for three years				.....	.....	17·48	.....	2,139·2
Total for six months, April to September				.....	.....	13·67	.....	1,435·0
Average for three years, April to September				.....	.....	14·06	.....	.....

CROP YIELDS.

The varieties of grains used in our general farm work are Marquis wheat, O.A.C. No. 21 barley and Banner oats.

YIELDS OF WHEAT.

The average yield per acre of Marquis wheat on 8 acres of fallow was 26 bushels 40 pounds in 1912, and 38 bushels 59 pounds in 1913. The average per acre on 6 acres of fall-ploughed stubble was 15 bushels 24 pounds in 1912, and 22 bushels 27 pounds in 1913. The yield per acre on 2 acres of corn ground was 33 bushels in 1912, and 52 bushels 11 pounds in 1913. It is rather significant that the average yield after corn (preceded by summer-tallow) is higher than the average yield for the same years directly after summer-fallow.

YIELDS OF BARLEY.

Manchurian barley yielded at the rate of 96 bushels 32 pounds per acre in 1911, and 55 bushels 40 pounds per acre in 1912. It is similar in appearance and yield to O.A.C. No. 21. Two acres of O.A.C. No. 21 on root ground yielded 45 bushels 27 pounds per acre in 1912, and 53 bushels 41 pounds per acre in 1913.

YIELDS OF OATS.

Six acres of Banner oats on fall-ploughed wheat stubble yielded an average of 69 bushels 26 pounds per acre in 1912, and 4 acres yielded an average of 74 bushels 19 pounds per acre in 1913.

ROTATION OF CROPS.

Four rotations have been in operation for three years, and a careful record kept of the total cost to operate and the resulting crop. The area of each lot in each rotation is exactly 2 acres, which makes the conditions as nearly like ordinary field conditions as is possible on a small Experimental Farm.

ROTATION "C."

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat or coarse grain.

ROTATION "J."

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat or coarse grain.

Fourth year.—Oats. Seeded down with rye grass, red clover and alfalfa.

Fifth year.—Hay.

Sixth year.—Pasture.

ROSTHERN.

ROTATION "P."

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat.

Fourth year.—Summer-fallow.

Fifth year.—Hoed crops or legumes.

Sixth year.—Barley. Seeded down with rye grass, red clover and alfalfa.

Seventh year.—Hay.

Eighth year.—Pasture.

ROTATION "R."

First year.—Summer-fallow.

Second year.—Hoed crop or legumes. Manured 15 tons per acre.

Third year.—Wheat.

Fourth year.—Oats.

Fifth year.—Summer-fallow.

Sixth year.—Wheat.

Seventh year.—Oats. Seeded down with rye grass, red clover and alfalfa.

Eighth year.—Hay.

Ninth year.—Pasture.

The valuations that have been fixed for computing the results of these rotation experiments will be found on page 156.

Details of operations in 1913, are given in the following tables:—

ROTATION "C"

Rotation Year.	Crops. 1912.	Crops. 1913.	Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Horse labour (including teamster). Hours. Single horse	2-horseteam	3-horseteam	4-horseteam	Value of horse labour.
			Ac.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	$ c.
1st...	Wheat	Summer-fallow	2	4 00	1 20					15		6 15
2nd...	Summer-fallow	Wheat	2	4 00	6 10	4	76		1½	8½		3 99
3rd...	Wheat	Wheat	2	4 00	6 95	4	76		1½	3½		1 95
	Aggregate		6	12 00	14 25	8	1 52		3	27		12 09
	Average per acre			2 00	2 37		25					2 01

ROTATION "J"

3rd...	Wheat	Wheat	2	4 00	6 95	4	76		1½	8½		3 99
4th...	Wheat	Oats	2	4 00	10 43	1	19		4½	3		2 76
5th...	Oats	Hay	2	4 00	1 20				3			1 02
6th...	Hay	Hay	2	4 00	1 20				3	6		3 48
1st...	Hay	Summer-fallow	2	4 00	1 20					18		7 38
2nd...	Summer-fallow	Wheat	2	4 00	7 05	4	76		1½	2¼		1 64
	Aggregate		12	24 00	28 03	9	1 67		13½	38¼		20 27
	Average per acre			2 00	2 33		14					1 69

ROTATION "P"

3rd...	Wheat	Wheat	2	7 75	6 95	4	76		1½	8½		3 89
4th...	Wheat	Summer-fallow	2	7 75	1 20				2	17		7 65
5th...	Summer-fallow	Roots	2	7 75	6 80	224½	42 66	8	3			3 18
6th...	Roots	Barley	2	7 75	11 53	5	95		1½	11		5 02
7th...	Barley	Hay	2	7 75	7 04	2	38			6½		2 66
8th...	Hay	Hay	2	7 75	1 20				3	6		3 48
1st...	Hay	Summer-fallow	2	7 75	1 20					18		7 38
2nd...	Summer-fallow	Wheat	2	7 75	6 30	3½	66		1½	7¼		3 68
	Aggregate		16	62 00	41 72	239	45 41					36 94
	Average per acre			3 88	2 60		2 84					2 31

ROTATION "R"

3rd...	Corn	Wheat	2	7 33	7 15	4	76		1½	11½		5 22½
4th...	Wheat	Oats	2	7 33	6 80	4	76		2½	7½		3 92½
5th...	Oats	Summer-fallow	2	7 33	1 20				1	14		6 08
6th...	Summer-fallow	Wheat	2	7 33	7 05	4	76		2½	3		2 08
7th...	Wheat	Oats	2	7 33	10 93				2½	4		2 49
8th...	Oats	Hay	2	7 33	1 20				3			1 02
9th...	Hay	Hay	2	7 33	1 20				3	6		3 48
1st...	Hay	Summer-fallow	2	7 33	1 20					18		7 38
2nd...	Summer-fallow	Corn	2	7 33	4 40	81	15 39	5	5	4½		4 89
	Aggregate		18	65 97	41 13	93	17 67	5	21	68½		36 57
	Average per acre			3 66	2 28		98					2 03

SESSIONAL PAPER No. 16

(Three years duration).

IN RAISING CROP.					PARTICULARS OF CROP.						
					Weight.						
Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Height of stubble.	Grain.	Straw.	Hay.	Hoed crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	Inch.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
.....	11 33	5 67	.....	.....	.....	.....	.....	.....	.....	.....	−5 67
5 93	20 78	10 39	24	.....	5,080	9,531	.....	.....	72 49	36 24	25 85
2 84	16 50	8 25	40	.....	2,430	5,126	.....	.....	34 96	17 48	9 23
8 77	48 63	.....	.....	.....	7,510	14,657	.....	.....	107 45	.....	.....
1 46	.....	8 10	.....	.....	.....	.....	.....	.....	.....	17 91	9 81
(Six years' duration).											
3 53	19 23	9 61	38	.....	3,030	7,067	.....	.....	43 93	21 96	12 35
.....	17 38	8 69	.....	.....	.....	.....	10,343	.....	51 71	25 85	17 16
.....	6 22	3 11	.....	.....	.....	.....	4,570	.....	22 85	11 42	8 31
.....	8 68	4 34	.....	.....	.....	.....	4,670	.....	23 35	11 67	7 33
.....	12 58	6 29	.....	.....	.....	.....	.....	.....	.....	.....	−6 29
5 20	18 65	9 33	25	.....	4,468	8,844	.....	.....	63 99	31 99	22 66
8 73	82 74	.....	.....	.....	.....	.....	.....	.....	205 83	.....	.....
72	.....	6 89	.....	.....	.....	.....	.....	.....	.....	17 15	10 26
(Eight years' duration).											
3 06	22 41	11 20	51	6	2,622	6,586	.....	.....	88 25	19 12	7 92
.....	16 60	8 30	.....	.....	.....	.....	.....	.....	.....	.....	−8 30
.....	60 39	30 19	.....	.....	.....	.....	.....	71,406	107 10	53 55	23 36
5 38	30 63	15 31	27	.....	5,170	6,766	.....	.....	58 46	29 23	13 92
.....	17 83	8 91	.....	.....	.....	.....	.....	.....	.....	.....	−8 91
.....	12 43	6 21	.....	.....	.....	.....	5,584	.....	27 92	13 96	7 75
.....	16 33	8 16	.....	.....	.....	.....	.....	.....	.....	.....	−8 16
4 99	23 38	11 69	32	6	4,230	7,656	.....	.....	60 89	30 44	18 75
13 33	200 00	.....	.....	.....	.....	.....	.....	.....	292 62	.....	.....
84	.....	12 50	.....	.....	.....	.....	.....	.....	.....	18 29	5 79
(Nine years' duration).											
7 30	27 76½	13 88	25	.....	6,262	9,661	.....	.....	88 32	44 16	30 28
6 75	25 56	12 78	26	.....	5,734	6,410	.....	.....	63 75	31 87	19 09
.....	14 61	7 30½	.....	.....	.....	.....	.....	.....	.....	.....	−7 30
5 70	22 92	11 46	28	.....	4,882	7,916	.....	.....	69 04	34 52	23 07
6 36	27 11	13 55	30	.....	5,408	5,822	.....	.....	59 90	29 95	16 40
.....	9 55	4 77	.....	.....	.....	.....	4,134	.....	20 67	10 32	5 56
.....	12 01	6 00	.....	.....	.....	.....	5,900	.....	29 50	14 75	8 75
.....	15 91	7 95	.....	.....	.....	.....	.....	.....	.....	.....	−7 95
.....	32 01	16 00	.....	.....	.....	.....	.....	79,240	118 86	59 43	43 43
26 11	187 45	.....	.....	.....	.....	.....	.....	.....	450 04	.....	.....
1 45	.....	10 41	.....	.....	.....	.....	.....	.....	.....	25 00	14 59

ROSTHERN.

Cost of Operations, Value of Products and Profits of Rotations "C," "J," "P," and "R."

Rotation.	Area.	Total cost to operate.	Total value of products.	Total profit.	Profit per Acre.	
					1912.	1913
	Acres.	$ c	$ c	$ c.	$ c.	$ c
"C" 3 years' duration	6	48 63	107 45	58 82	3 89	9 81
"J" 6 years' duration	12	82 74	205 83	123 09	5 66	10 26
"P" 8 years' duration	16	200 00	292 62	92 62	7 65	5 79
"R" 9 years' duration	18	187 45	450 04	262 59	11 26	14 59

The results from two years' work on these rotations tend to show:—

1. That land worked under a rotation including grains and hay gives a greater profit per acre than where wheat alone is grown, and this is emphasized in a season of early frosts.

2. That a hoed crop in the rotation increases the cost of operation per acre, but very much more increases the profit per acre as well as the yield of the succeeding grain crops.

3. That the diversity of crops affords more suitable food for live stock. When these crops are marketed through the medium of live stock, greater profit per acre would accrue than is here shown.

CULTURAL INVESTIGATION WORK.

A series of soil cultural experiments has been carried on for two years. Marked results as yet have not been obtained. Some treatments that were apparently superior in 1912 have proven inferior in 1913. When, however, these results are related to the precipitation for the corresponding seasons the discrepancies are at least partly explained. The total precipitation for the year ending March, 1913, was 18·60 inches, and for the year ending March, 1914, was 15·50 inches. There were 3 inches more rainfall in 1912 than in 1913, and yet the crops suffered more from drought in 1912 than in 1913 because of the difference in the distribution throughout the season. In 1912 there was no rain in June until the end of the month, and then there were over 7 inches before the end of July. In 1913 the showers were more frequent.

Following are the results of the various experiments under way:—

PRAIRIE BREAKING.

In this experiment five plots are broken each year according to the directions given below. Test No. 1 was commenced in 1911 and No. 2 in 1912. Test No. 1 will be concluded in 1915 and No. 2 in 1916.

The sequence of the crops is as follows:—

First year.—Broken and treated as indicated below.

Second year.—Wheat.

Third year.—Wheat.

Fourth year.—Summer-fallow.

Fifth year.—Wheat.

TEST NO. 1, BROKEN 1911.

The stubble of the wheat crop which followed the breaking of 1911, was ploughed in the fall of 1912, harrowed April 23, 1913, disced and sown to Marquis wheat April 24, packed April 25. Wheat came up May 20, headed out July 14, ripened and was cut on August 30.

Test No. 1, Broken 1911.

Plot No.	Treatment when breaking 1911.	Yield of wheat per acre 1912.	Yield of wheat per acre 1913.
		Lb.	Lb.
1	Plough 3 inches to 4 inches early spring, pack, double disc, harrow, double disc, sow to peas and oats	2,040	1,680
2	Plough 3 inches to 4 inches early spring, pack, double disc, harrow, double disc, sow to flax	2,000	2,080
3	Plough 3 inches to 4 inches early spring, pack, double disc, harrow, sow to flax	1,680	2,280
4	Break early June, 4 inches to 5 inches, keep cultivated from day broken	2,440	1,880
5	Break early June, 2 inches to 3 inches, roll, backset early September, keep cultivated from day broken	2,160	2,960

DEPTH OF PLOUGHING WHEAT STUBBLE TO BE SOWN TO OATS.

The wheat stubble was ploughed in the spring of 1913 for the oat crop of 1913.

Depth of Ploughing Wheat Stubble to be sown to Oats.

Plot No.	Depth of ploughing.	Yield of Oats per acre 1913.
		Lb.
1	Ploughed 3 inches deep	3,400
2	" 4 " "	3,440
3	" 5 " "	4,160

DEPTH OF PLOUGHING SUMMER-FALLOW TO BE SOWN TO WHEAT.

The summer-fallow for the crop of 1913 was ploughed on June 8, 1912.

Depth of Ploughing Summer-fallow to be sown to Wheat.

Plot No.	Depth of ploughing summer-fallow.	Yield of wheat per acre 1913.
		Lb.
1	Ploughed 3 inches deep	2,080
2	" 4 " "	2,160
3	" 5 " "	2,240
4	" 6 " "	2,360
5	" 7 " "	2,280
6	" 8 " "	2,400
7	" 5 " " subsoiled 4 inches	2,600
8	" 6 " " " 4 "	2,560
9	" 7 " " " 4 "	2,840
10	" 8 " " " 4 "	2,600

DEPTH OF PLOUGHING SOD.

Western rye grass sod was ploughed July 19, 1912, for a crop of wheat in 1913.

DEPTH OF PLOUGHING Sod to be sown to Wheat.

Plot No.	Depth of ploughing sod.	Yield of wheat per acre 1913.
		Lb.
1	Ploughed 3 inches deep	2,440
2	" 4 " "	2,640
3	" 5 " "	2,480

SUMMER-FALLOW TREATMENT.

Seventeen plots were summer-fallowed as given below and sown to wheat followed by oats.

TREATMENT OF SUMMER-FALLOW to be sown to Wheat followed by Oats.

Plot No.	Treatment of summer-fallow 1912.	Yield of wheat per acre, 1913.
		Lb.
1	Plough 4 inches June, pack if necessary and practicable, cultivate as necessary	2,000
2	Plough 6 inches June, pack if necessary and practicable, cultivate as necessary	2,320
3	Plough 8 inches June, pack if necessary and practicable, cultivate as necessary	2,240
4	Plough 4 inches June, cultivate. Plough 4 inches September, harrow	2,000
5	Plough 6 inches June, cultivate. Plough 6 inches September, harrow	1,920
6	Plough 8 inches June, cultivate. Plough 8 inches September, harrow	1,920
7	Plough 6 inches June, cultivate. Plough 4 inches September, harrow	1,920
8	Plough 4 inches June, cultivate. Plough 6 inches September, harrow	1,680
9	Plough 4 inches June, early as possible, cultivate. Plough 6 inches September, leave untouched	1,560
10	Plough 5 inches June, seed to rape or other green forage crop and pasture off	1,280
11	Plough 6 inches May 15, harrow and pack if necessary, cultivate as necessary	2,240
12	Plough 6 inches June 15, harrow and pack if necessary, cultivate as necessary	2,400
13	Plough 6 inches July 15, harrow and pack if necessary, cultivate as necessary	2,440
14	Fall cultivate before summer-fallowing. Plough 6 inches June, harrow and pack if necessary, cultivate as necessary	2,600
15	Fall plough 4 inches before summer-fallowing. Plough 6 inches June, harrow and pack if necessary, cultivate as necessary	2,680
16	Plough 6 inches June, pack, cultivate as necessary	2,440
17	Plough 6 inches June, no packing, otherwise same as other plots	2,680

GREEN MANURING.

This experiment shows more than any other at the Station the beneficial effect of barnyard manure. Throughout the season plot 5, on which barnyard manure was applied for wheat, stood from two to four inches higher than the other plots, and a similar advantage was noted on the succeeding oat crop.

GREEN MANURING for Wheat followed by Oats.

Plot No.	Treatment of land year previous to wheat.	Yield of wheat per acre. 1913.
		Lb.
1	Summer-fallow	2,720
2	Peas, ploughed under early in July	2,680
3	Peas, ploughed under when in bloom	2,440
4	Tares, ploughed under late July	2,520
5	Summer-fallow, barnyard manure 12 tons per acre applied on summer-fallow in September	3,680
6	Summer-fallow	2,280

DEPTHS OF SEEDING.

Oats and wheat were sown at depths varying from one to four inches.

DEPTHS of Seeding Wheat.

Plot No.	Depth sown.	Yield of wheat per acre 1913.
		Lb.
1	Sowing 1 inch deep	2,720
2	" 2 inches deep	2,760
3	" 3 "	2,560
4	" 4 "	2,120

DEPTHS of Seeding Oats.

Plot No.	Depth sown.	Yield of oats per acre 1913.
		Lb.
1	Sowing 1 inch deep	3,800
2	" 2 inches deep	3,600
3	" 3 "	4,320
4	" 4 "	4,360

ROSTHERN.

EXPERIMENTAL STATION FOR NORTHWESTERN SASKATCHEWAN, SCOTT, SASK.

REPORT OF THE SUPERINTENDENT, R. E. EVEREST, B.S.A.

WEATHER AND CROP CONDITIONS, 1913.

The season of 1913 was favourable to growth and a fair crop of good quality was harvested. Seeding commenced April 8, haying July 23, the harvesting of grain August 7. On October 27 the ploughing was stopped by frost.

Some Weather Observations taken at Scott Experimental Station, 1913.

Month.	Temperature F.			Precipitation.				Total sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	Heaviest. in 24 hours.	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	—8·86	38·8	—48·8	.....	.....	0·59	.....	83·9
February	3·33	38·8	—35·4	.....	.....	0·42	.....	104·4
March	11·08	46·0	—35·6	.....	.....	0·23	.....	157·4
April	43·23	79·0	14·1	0·15	.....	0·15	0·09	238·1
May	45·61	84·9	18·2	0·95	.....	0·95	0·50	247·3
June	56·72	90·1	28·7	1·28	.....	1·28	0·40	220·1
July	59·85	87·4	35·2	2·98	.....	2·98	0·85	282·3
August	59·89	86·1	34·3	2·62	.....	2·62	0·68	238·8
September	51·24	86·0	20·1	1·24	.....	1·24	1·21	284·5
October	32·99	72·0	—5·4	0·46	.....	0·46	0·20	137·0
November	23·49	54·8	—8·8	.....	2·5	0·25	0·25	108·8
December	15·57	40·5	—12·8	.....	·75	0·08	0·05	101·1
Total for year				9·68	3·25	11·25	.....	2153·7

YIELDS OF FIELD CROPS.

Field Crop Areas and Yields, Scott, 1913.

Crop.	Acreage.	Yield per acre.
Wheat, Marquis	15·80	25 bush.
Oats, Legowo	6·20	54 "
Oats, Banner	0·80	98 "
Barley, Manchurian	1·50	20 "
Peas, Arthur	3·83	23 "
Western Rye Grass Hay	.....	1 ton 937 lb.
Peas and oats (cured for hay)	.....	1 ton 181 lb.

COST OF PRODUCTION OF FIELD CROPS.

In recording the results of the rotation experiments figures on the cost of production of the various crops have been obtained. They are summarized in the following table.

COST OF PRODUCTION of Field Crops, Scott, 1913.

Crop.	Area.	Yield per acre.		Cost to produce.	
				Per acre.	Per bushel.
	Acres.	Bush.	Lb.	$ cts.	Cents.
Wheat	15·94	23	15	7 78	33·46
Oats	4·53	52	10	8 36	15·99
Barley	1·50	20	16	7 44	36·59
Peas	3·83	22	18	8 94	40·19

ROTATION OF CROPS.

ROTATION "A" (GRAIN CONTINUOUSLY).

On this area, which comprises 1 acre, wheat is the grain crop used. The land is given good cultivation. No return of manure or fertilizer is made to this area. By carrying on this work over a series of years information as to the power of our soil to grow wheat continuously will be obtained.

ROTATION "C" (THREE YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat.

Rotation "C" is a straight grain-growing rotation commonly used where it is desired to make wheat the main crop. When the cultural operations are timely, and thoroughly performed, this rotation is fairly satisfactory for a time at least. By its use the land may be kept clean and in a good state of tilth. Further, the growing of two crops with the use of three years' rainfall ensures to the growing crop a sufficient amount of moisture to produce a fair yield of wheat. There is the danger in this rotation that in time the soil will become deficient in fibre and humus, that crop yields will show a falling off, and that the single crop may meet with some disaster from inclement weather before maturity. The net profit per acre from rotation "C" in 1913 was $4.78.

SCOTT.

ROTATION "J" (SIX YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat.

Fourth year.—Oats. Seeded down with 10 pounds western rye grass, 3 pounds red clover and 3 pounds alfalfa per acre.

Fifth year.—Hay.

Sixth year.—Pasture.

Rotation "J" is a mixed-farming rotation. It provides pasture for summer feeding and hay and grain for winter feeding of stock. With one-third of the land in wheat considerable revenue is obtained from marketing this product. From a labour standpoint also, rotation "J" is well suited to our conditions. None of the crops grown requires any extra labour in its handling. The spread of the work over the caring for stock, seeding, summer-fallowing, haying and harvesting is a consideration worthy of note. The addition of fibre and humus to the soil from the meadow and pasture years of the rotation tends towards the upkeep of fertility and the conservation of moisture. Just whether or not this together with only one summer-fallow in six years will be sufficient means to maintain a moisture content equal to the needs of the plant, can be determined only by many years of experiment The net profit from this rotation in 1913 was $5.95.

ROTATION "P" (EIGHT YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat.

Fourth year.—Summer-fallow.

Fifth year.—Roots or legume. Manured 15 tons per acre.

Sixth year.—Barley. Seeded down with 10 pounds western rye grass, 3 pounds red clover and 3 pounds alfalfa per acre.

Seventh year.—Hay.

Eighth year.—Pasture.

Rotation "P" is a mixed-farming rotation suited to conditions where it is desired to sell some grain and to grow fodder and coarse grain for live stock. Moisture is amply provided for by including two summer-fallows and a possible hoed crop in the course of eight years. To the hoed crop or legume are applied 15 tons of manure per acre. This, in addition to the hay and pasture years should do much towards the upkeep of fertility and the maintenance of crop yields. This rotation gives a place for the marketing of grain in that one-quarter of the area is in wheat. A strong point is the provision made for growing valuable concentrated foods which could be used in the rearing and fitting of live stock or in dairying.

The net profit per acre of rotation "P" in 1913 was $4.40.

SCOTT.

ROTATION "R" (NINE YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Hoed crop or legume. Manured 15 tons per acre.

Third year.—Wheat.

Fourth year.—Oats.

Fifth year.—Summer-fallow.

Sixth year.—Wheat.

Seventh year.—Oats. Seeded down with 10 pounds western rye grass, 3 pounds red clover and 3 pounds alfalfa per acre.

Eighth year.—Hay.

Ninth year.—Pasture.

Rotation "R" permits of mixed farming. Four-ninths of the land is devoted to the production of oats, hay and pasture. One-ninth would be in roots or legumes. To wheat is allotted only a small area, two-ninths of the whole being given to its production. This rotation will be valuable in cases where the rearing and fitting of horses for market and the keeping of other live stock are the aim, but for the present it is not likely to prove very popular, as wheat receives so little prominence.

The net profit per acre of rotation "R" in 1913 was $5.53.

In the following tables details regarding these rotations are given. The values used will be found on page 156.

ROTATION EXPERIMENT.—Comparative Costs, Returns and Net Profits per Acre.

Rotation.	Total cost to operate 1913.	Value of returns 1913.	Net profit 1913.
	$ cts.	$ cts.	$ cts.
"A" one years' duration	8 99	17 78	8 79
"C" three years' duration	7 32	12 10	4 78
"J" six years' duration	7 54	13 49	5 95
"P" eight years' duration	7 59	11 99	4 40
"R" nine years' duration	6 85	13 48	6 63

ROTATION "A"

Rotation Year	Crops.		Area.	Items of Expense								
				Rent and manure.	Seed, twine and use of machinery.	Manual labour.		Horse labour (including teamster.) Hours.				
						Hours.	Cost.	Single horse	2-horse team.	3-horse team.	4-horse team.	5-horse team.
	1912.	1913.	Ac.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
1st	Wheat	Wheat	1	2 00	2 40	1¼	24		1½		4½	

ROTATION "C"

3rd	Wheat	Wheat	1½	3 00	3 60	1½	28		3½		5¼	
4th	Wheat	Summer-fallow	1½	3 00	90						10½	
5th	Summer-fallow	Wheat	1½	3 00	3 60	1¼	25		2½		1½	
	Aggregate		4½	9 00	8 10	2½	53		6½		17¼	
	Average per acre			2 00	1 80		12					

ROTATION "J"

3rd	Wheat	Wheat	2	4 00	4 80	2½	51		3¼		7¼	
4th	Wheat	Oats, seeded	2½	4 40	4 18	3	57		4½		6½	
5th	Oats	Peas and oats, seeded	2½	4 40	5 28	10½	1 99		11½		6½	
6th	Hay	Pasture	2½	4 40	3 50	20	3 80		12½			
1st	Hay	Summer-fallow	2½	4 40	1 32				1¼		12½	
2nd	Summer-fallow	Wheat	2½	4 40	5 28	2¼	52		2½		2½	
	Aggregate		13	26 00	24 36	38	7 39		34½		35	
	Average per acre			2 00	1 87		57					

ROTATION "R"

3rd	Peas	Wheat	2½	4 67	5 60	3	57		2½		6½	
4th	Wheat	Oats	2½	4 67	4 43	3	57		4		7	
5th	Oats	Summer-fallow	2½	4 67	1 40				3		12½	
6th	Summer-fallow	Wheat	2½	4 67	5 60	2½	44		3½		3	
7th	Wheat	Oats, seeded	2½	4 67	4 43	2½	47		4½		7½	
8th	Seeded alone	Hay	2½	4 67	5 11	11½	2 45		15			
9th	Hay	Pasture	2½	4 67	3 18							
1st	Hay	Summer-fallow	2½	4 67	1 40						13½	
2nd	Summer-fallow	Peas	2½	4 67	4 90	12	2 28		5½		1½	
	Aggregate		21	42 03	36 05	34½	6 48		38½		51½	
	Average per acre			2 00	1 72		31					

ROTATION "P"

3rd	Wheat	Wheat	1½	3 00	3 60	1½	28		2½		5½	
4th	Wheat	Summer-fallow	1½	3 00	90				2		8½	
5th	Summer-fallow	Peas	1½	3 00	3 15	10	1 90		4		4	
6th	Peas	Barley seeded	1½	3 00	2 85	2½	55		2½		5½	
7th	Barley, seeded	Hay	1½	3 00	2 28	10	1 90		7½			
8th	Oats	Peas and oats	1½	3 00	3 60	11	2 09		11½		5½	
1st	Hay	Summer-fallow	1½	3 00	90				1		11½	
2nd	Summer-fallow	Wheat	1½	2 75	3 30	2	34		2½		3½	
	Aggregate		11·875	23 75	21 58	56½	9 31		38½		39½	
	Average per acre			2 00	1 82		54					

SESSIONAL PAPER No. 16

(Wheat continuously).

IN RAISING CROP.						PARTICULARS OF CROP.							
							Weight.						
Value or horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Hoed crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	Cts.	$ c.	Inches.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
2 86	1 49	8 98	8 98	42	.....	6½	1,280	1,420	.....	.....	17 78	17 78	8 79
(Three Years' Duration).													
3 71	2 37	12 96	8 64	38	.....	6½	2,030	2,165	.....	.....	28 15	18 76	10 12
5 40	.....	9 30	6 20	.....	.....	.....	.....	.....	.....	.....	.....	.....	−6 20
1 62	2 22	10 69	7 12	34	.....	6½	1,900	2,070	.....	.....	26 28	17 52	10 40
10 73	4 59	32 95	.....	.....	.....	.....	3,930	4,235	.....	.....	54 43	.....	.....
2 38	1 02	.....	7 3-	.....	.....	.....	.....	.....	.....	.....	.....	12 09	4 77
(Six Years' Duration).													
4 62	3 14	17 07	8 53	38	.....	6½	2,695	3,035	.....	.....	37 45	18 72	10 19
4 43	4 82	18 40	8 36	10½	.....	7½	4,100	2,855	.....	.....	43 85	19 93	11 57
6 97	.....	18 64	8 47	.....	.....	6	.....	.....	.....	4,175	20 87	9 49	1 02
4 19	.....	15 89	7 22	.....	.....	.....	.....	.....	5,780	.....	28 90	13 14	5 92
6 67	.....	12 39	5 63	.....	.....	.....	.....	.....	.....	.....	.....	.....	−5 63
1 78	3 71	15 69	7 13	30	.....	6½	3,180	3,865	.....	.....	4,433	20 15	13 02
28 66	11 67	98 03	.....	.....	.....	.....	.....	.....	.....	.....	175 40	.....	.....
2 21	90	.....	7 55	.....	.....	.....	.....	.....	.....	.....	.....	13 50	5 5
(Nine Years' Duration).													
4 17	4 07	19 08	8 18	33	.....	6½	3,488	4,642	.....	.....	48 83	20 93	12 75
4 72	4 65	19 04	8 16	16	.....	7½	3,950	3,060	.....	.....	42 56	18 24	10 08
6 94	.....	13 01	5 58	.....	.....	.....	.....	.....	.....	.....	.....	.....	−5 58
2 52	3 58	16 81	7 20	33	.....	6½	3,066	4,384	.....	.....	43 07	18 44	11 24
5 10	5 14	19 81	8 49	15	.....	7½	4,370	7,840	.....	Pasture	51 54	22 09	13 60
5 16	.....	17 09	7 32	.....	.....	.....	.....	.....	8,745	days.	43 72	18 74	11 42
.....	.....	7 85	3 36	.....	.....	.....	.....	.....	.....	90	3 00	1 29	−2 07
6 98	.....	13 05	5 59	.....	.....	.....	.....	.....	.....	.....	.....	.....	−5 59
2 10	4 15	18 10	7 76	30	.....	.....	3,556	2,924	.....	.....	50 33	21 57	13 81
37 69	21 59	143 84	.....	.....	.....	.....	.....	.....	.....	.....	283 05	.....	.....
1 79	1 03	.....	6 85	.....	.....	.....	.....	.....	.....	.....	.....	13 48	6 63
(Eight Years' Duration).													
3 45	2 33	12 66	8 44	33	.....	6½	2,000	2,305	.....	.....	27 82	18 54	10 10
4 91	.....	8 81	5 87	.....	.....	.....	.....	.....	.....	.....	.....	.....	−5 87
1 52	2 02	11 59	7 72	40	.....	.....	1,730	2,125	.....	.....	25 19	16 79	9 07
3 36	1 52	11 16	7 44	37	.....	7½	1,464	4,115	.....	green-	18 75	12 50	5 06
2 55	.....	10 73	7 15	.....	.....	.....	.....	.....	3,130	feed.	15 65	10 44	3 29
6 37	.....	15 06	10 04	.....	.....	6	.....	.....	.....	3,895	19 48	12 98	2 94
5 78	.....	9 68	6 46	.....	.....	.....	.....	.....	.....	.....	.....	.....	−6 46
2 22	1 79	10 44	7 60	26	.....	6½	2,534	3,411	.....	.....	35 50	25 82	18 22
30 16	7 66	90 13	..	.....	.....	.....	.....	.....	.....	.....	142 39	.....	.....
2 54	65	.....	7 59	.....	.....	.....	.....	.....	.....	.....	.....	11 99	4 40

DATES OF SEEDING.

Experiments were conducted with wheat, oats and barley in dates of seeding with the object of determining the time of seeding best suited to these crops. The following results were given this year:—

Dates of Seeding Spring Wheat.

Variety.	Date of sowing.	Date of ripening.	Number of days to mature.	Average length of straw including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.
				Inches.		Inches.	Lb.	Bush. Lb.
Marquis	April 11	August 22	123	33½	10	2¼	1,220	20 20
"	" 18	" 27	131	34	10	2¼	1,700	28 20
"	" 25	" 28	125	33	10	2½	1,760	29 20
"	May 2	Sept. 1	122	34	10	2¼	2,100	35 00
"	" 9	" 2	116	33½	10	2¼	2,000	33 20

It will be noted that the fourth date of seeding May 2 gave the highest yield. This is partly accounted for by the fact that a slight drought followed the earlier seedings.

Dates of Seeding Oats.

Variety.	Date of sowing.	Date of ripening.	Number of days to mature.	Average length of straw including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.
				Inches.		Inches.	Lb.	Bush. Lb.
Banner	April 11	August 19	120	44	10	6½	2,400	70 20
"	" 18	" 21	125	45	10	7½	2,840	83 18
"	" 25	" 25	122	43	10	7¼	2,640	77 22
"	May 2	" 27	117	44	10	7¼	3,440	101 6
"	" 9	" 28	111	44½	10	7¼	2,820	82 32

Dates of Seeding Barley.

Variety.	Date of sowing.	Date of ripening.	Number of days to mature.	Average length of straw including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.
				Inches.		Inches.	Lb.	Bush. Lb.
Manchurian	April 11	August 12	123	42	10	3¼	1,880	39 8
"	" 18	" 15	119	41	10	3	1,320	27 24
"	" 25	" 16	113	40	10	3¼	1,560	32 24
"	May 2	" 18	109	43	10	4	1,680	35 00
"	" 9	" 21	104	42	10	4	1,720	35 40

It will be noticed that the first seeding, April 11, and the last seeding, May 9, gave the highest and next highest yields respectively. This is a condition difficult to account for. Throughout the season it appeared that the plot sown first had a decided advantage over the plots sown on the four later dates, but when threshed out the plot sown last yielded surprisingly high.

RATES OF SEEDING.

Rates of Seeding Marquis Wheat on Summer-fallow.

Variety.	Quantities of seed per acre.	Date of sowing.	Date of ripening.	Number of days to mature.	Average length of straw including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.
					Inches.		Inches.	Lb.	Bush. Lb.
Marquis	¾ bush.	April 11	Aug. 25	136	33½	10	2¾	1,440	24 00
"	1¼ "	" 11	" 25	136	33	10	2½	1,440	24 00
"	1¾ "	" 11	" 20	131	34	10	3	2,080	34 40
"	2¼ "	" 11	" 19	130	35	10	2¾	2,100	35 00
"	2¾ "	" 11	" 19	130	34½	10	2¼	1,920	32 00

Two and one-quarter bushels per acre was the amount of seed giving the largest yield. After the quantity of seed sown is deducted it will be seen that 1¾ bushels per acre gave the largest net return.

Rates of Seeding Banner Oats on Summer-fallow.

Variety.	Quantities of seed per acre.	Date of sowing.	Date of ripening.	Number of days to mature.	Average length of straw including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.
					Inches.		Inches.	Lb.	Bush. Lb.
Banner	1 bush.	April 29	Aug. 28	121	49	10	7¼	3,200	94 4
"	1½ "	" 29	" 25	118	42½	10	7	3,780	111 6
"	2 "	" 29	" 22	115	42	10	7	3,200	94 4
"	2½ "	" 29	" 22	115	43	10	7¾	2,400	70 20
"	3 "	" 29	" 22	115	43	10	7	2,760	81 6
"	3½ "	" 29	" 21	114	40	10	6½	2,780	81 20

It will be noted that 1½ bushels per acre is the rate giving the highest yield. In 1912 seeding at the rate of one bushel per acre had a decided advantage over the five heavier seedings used. The results of these two years' work would indicate the advisability of using smaller quantities of seed oats per acre on well prepared land than is at present done. Further work will be carried out in this connection.

SCOTT.

RATES of Seeding Manchurian Barley on Summer-fallow.

Variety	Quantities of seed per acre.	Date of sowing.	Date of ripening.	Number of days to mature.	Average length of straw including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.
					Inches.		Inches.	Lb.	Bush. Lb.
Manchurian	1 Bush.	April 29	Aug. 18	111	43¼	10	4	1,640	34 8
"	1½ "	" 29	" 19	112	42	10	4	1,500	31 12
"	2 "	" 29	" 19	112	42½	10	4½	1,240	25 40
"	2½ "	" 29	" 19	112	43½	10	4½	1,440	30 00
"	3 "	" 29	" 19	112	42½	10	4¾	1,520	31 32

One bushel of barley seed per acre gave the largest yield. This result was obtained in 1912. From these two years' work favouring the 1 bushel seeding we are inclined to think that somewhat lighter seedings than are usually given with this cereal would be good practice for this section of country.

SOIL CULTURAL EXPERIMENTS.

Four experiments in methods of cultivation of field crops are now under way, namely:—

Prairie breaking.
Seeding to grass and clover.
Soil packers.
Depth of seeding.

The prairie breaking and soil packing experiments are not being reported upon as no decisive data have yet been obtained.

SEEDING TO GRASS AND CLOVER.

In 1911 an experiment was begun to determine the best preceding crops and soil preparation for seeding to western rye grass and red clover. The yields of hay this year were as follows:—

SEEDING to Grass and Clover.

Plot No.	Treatment 1911.	Treatment 1912.	Crop 1913.	Yield per acre.	Yield per acre.
				Lb.	Tons. Lb.
1	Summer-fallow	Seeded with wheat	Hay	4,400	2 400
2	Summer-fallow	Seeded alone	Hay	5,200	2 1,200
3	Hoed crop	Seeded with wheat	Hay	4,800	2 800
4	Hoed crop	Seeded alone	Hay	4,680	2 680
5	Wheat	Seeded with wheat	Hay	3,240	1 1,240
6	Wheat	Seeded alone	Hay	3,160	1 1,160
7	Wheat	Seeded with oats	Hay	1,720	0 1,720
8	Wheat	Seeded alone	Hay	2,080	1 80
9	Wheat	Seeded with wheat	Hay	2,820	1 820
10	Oats	Seeded alone	Hay	2,400	1 400
11	Wheat	Seeded with wheat	Hay	3,860	1 1,860

SCOTT.

It will be noted that the four highest yields were obtained from seeding with and without a nurse crop after summer-fallow or hoed crop. It would appear evident from the results of the one year's work that a good catch of seeds is much more likely to be obtained when the preparatory treatment is summer-fallow or hoed crop than when oats or wheat are grown.

DEPTHS OF SEEDING.

DEPTHS of Seeding Wheat.

Plot No.	Depths sown.	Date of Sowing.	Date of Coming up.	Date of Heading.	Date of Ripening.	Days to Mature.	Yield of wheat per acre.	
							Grain.	Straw.
							Lb.	Lb.
1	Sowing 1 inch deep.....	April 18..	May 9..	July 5..	Aug. 21..	125	1,860	3,940
2	Sowing 2 inches deep..	" 18	" 10	" 4..	" 21..	125	1,960	3,840
3	Sowing 3 inches deep..	" 18..	" 10..	" 3..	" 19.	123	1,980	2,820
4	Sowing 4 inches deep..	" 18..	" 12..	" 5..	" 21.	125	1,780	3,820

DEPTHS of Seeding Oats.

Plot No.	Depths Sown.	Date of Sowing.	Date of Coming up.	Date of Heading.	Date of Ripening.	Days to Mature.	Yield of wheat per acre.	
							Grain.	Straw.
							Lb.	Lb.
1	Sowing 1 inch deep.....	April 28..	May 17..	July 4..	Aug. 21.	115	1,040	2,560
2	Sowing 2 inches deep.....	" 28..	" 17..	" 4..	" 21..	115	1,680	3,1[illegible]0
3	Sowing 3 inches deep.....	" 28..	" 19..	" 5..	" 19..	113	1,580	2,420
4	Sowing 4 inches deep.....	" 28..	" 20..	" 5..	" 19..	113	1,440	3,360

EXPERIMENTAL STATION FOR SOUTHERN ALBERTA, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S.

SEASONAL CONDITIONS.

The season of 1913 opened at about the usual time for the district. Winter grain however, suffered, many areas in the winter wheat fields being badly injured owing to the high, dry winds that prevailed. Spring seeding commenced early in April; germination was rapid and a good stand was obtained in all cases. The rainfall during the spring was scant, especially during late May and early June. Crops of all kinds suffered acutely, particularly early sown grain. The rainfall for the growing season was as follows:—

April	0·52	inches.
May	1·70	"
June	4·70	"
July	1·29	"
August 1 to 15	1·22	"
Total	9·43	"

Although the precipitation for June was reasonably satisfactory, generous rains were not received till the 16th; from then to the end of the month moisture was abundant; 4·3 inches out of 4·7 inches for the month fell during this period. The late rain, however, stimulated a second growth which caused uneven ripening and thus materially reduced the yield and quality of both wheat and barley. The effect on oats was not so serious, the second growth being so strong and vigorous that it reached maturity before any great loss was sustained from the shelling of the first growth.

The rainfall over the southern part of the province was quite uneven, some localities being more favoured than others. One of the districts where the grain crops were comparatively good was along the Aldersyde branch of the Canadian Pacific railway from Monarch and Carmangay.

SESSIONAL PAPER No. 16

SOME WEATHER OBSERVATIONS taken at Lethbridge Experimental Station, 1913.

Month.	Temperature F.			Total Precipitation.	Total Sunshine.
	Mean.	Highest.	Lowest.		
	°	°	°	Inches.	Hours.
January		47·0	−30·0	·80	91·9
February		57·8	−22·0	·30	102·1
March		59·9	−23·0	·42	157·3
April	43·8	81·2	17·0	·52	223·4
May	48·45	83·3	19·2	1·70	244·8
June	60·96	86·6	39·9	4·70	281·8
July	61·89	89·2	38·0	1·29	345·0
August	54·21	92·8	35·8	1·93	321·2
September	59·9	89·3	26·2	1·65	276·5
October	39·2	78·2	12·3	·50	152·7
November	35·1	58·0	9·0	·36	121·8
December	29·57	60·0	− 7·0	·00	156·0
Total for year				14·17	2,474·5

As there are two distinct farms being operated at this Station, one irrigated and one non-irrigated, the report is divided to avoid any possible confusion.

LETHBRIDGE.

PART I.—THE NON-IRRIGATED OR "DRY FARM."

CROP ROTATIONS (NON-IRRIGATED).

This is the third season for the following rotations:—

ROTATION "A."

Wheat continuously.

ROTATION "B" (TWO YEARS' DURATION).

First year.—Wheat.

Second year.—Summer-fallow.

ROTATION "C" (THREE YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat, or coarse grain.

ROTATION "M" (SIX YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Coarse grain. Manured in fall.

Fourth year.—Summer-fallow.

Fifth year.—Peas and oats for hay.

Sixth year.—Barley or oats.

ROTATION "S" (NINE YEARS' DURATION)

First year.—Summer-fallow.

Second year.—Hoed crop.

Third year.—Wheat.

Fourth year.—Summer fallow.

Fifth year.—Wheat.

Sixth year.—Coarse grain.

Seventh year.—Summer-fallow. Manured.

Eighth year.—Peas and oats for hay. Seeded in fall to rye.

Ninth year.—Rye pasture.

LETHBRIDGE.

ROTATION "T" (TEN YEARS' DURATION).

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Oats or barley.

Fourth year.—Seeded to alfalfa in rows.

Fifth year.—Alfalfa hay or seed.

Sixth year.—Alfalfa hay or seed.

Seventh year.—Alfalfa hay, seed or pasture.

Eighth year.—Summer-fallow.

Ninth year.—Hoed crop.

Tenth year.—Wheat. Manured on stubble.

So that the results from year to year may be easily compared, cost and return values have been fixed, schedule of which will be found on page 156. The following tables contain details in connection with these rotations:—

5 GEORGE V., A. 1915

ROTATION "A"

Rotation Year.	Crops.		Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour. Hours.	Manual labour. Cost.	Horse labour (including teamster). Hours. Single horse	2-horse team.	3-horse team.	4-horse team.	5-horse team.
	1912.	1913.	Ac.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	$ c.
	Wheat	Wheat	1·57	3 14	3 71	1¼	24			1¼	5⅔	
	Aggregate											
	Average per acre			2 00	2 36		15					

ROTATION "B"

1st	Wheat	Summer-fallow	1·57	3 14	94	½	10				8½	
2nd	Summer-fallow	Wheat	1·57	3 14	3 70	3¼	63			1½	⅔	
	Aggregate		3·14	6 28	4 64		73					
	Average per acre			2 00	1 48		23					

ROTATION "C"

3rd	Wheat	Oats	1·57	3 14	2 87	3¼	62			1	5⅔	
1st	Oats	Fallow	1·57	3 14	94	¼	05				8½	
2nd	Summer-fallow	Wheat	1·57	3 14	3 70	1¾	33			1	¾	
	Aggregate		4·71	9 42	7 51		1 00					
	Average per acre			2 00	1 59		21					

ROTATION "M"

3rd	Wheat	Oats	1·25	5 00	2 96	1¾	33		1¼	½	5¾	
4th	Oats	Summer-fallow	1 25	5 00	75	⅝	16				6¾	
5th	Summer-fallow	Peas and Oats	·59	2 36	1 26	⅜	16		⅓		2⅔	
			·66	2 64	1 57	3⅛	71		2⅓	1⅛		
6th	Peas and Oats	Oats	1 25	5 00	2 48	1⅞	30			1⅞	5⅔	
1st	Oats	Summer-fallow	1 25	5 00	75	1	19				5⅔	
2nd	Summer-fallow	Wheat	1 25	5 00	2 99	1½	28			1½	⅔	
	Aggregate		7·5	30 00	12 76		2 13					
	Average per acre			4 00	1 70		29					

LETHBRIDGE.

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(Wheat continuously.)

IN RAISING CROP.							PARTICULARS OF CROP.						
							Weight.						
Value of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Hoed crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	Inch	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
3 20	1 87	12 16	7 74	46	.....	5	1,600	2,690	.....	.....	22 67	14 44	6 70
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2 03	1 19	.....	7 74	.....	.....	.....	.....	.....	.....	.....	.....	14 44	6 70
(Two Years' Duration).													
3 92	.....	8 10	5 16	.....	.....	.....	.....	.....	.....	.....	.....	.....	−5 16
80	2 47	10 74	6 84	30	.....	5	2,120	2,415	.....	.....	29 48	18 77	11 93
4 72	2 47	18 84	12 00	.....	.....	.....	.....	.....	.....	.....	29 48	.....	.....
1 50	78	6 00	6 00	.....	.....	.....	.....	.....	.....	.....	.....	9 38	3 38
(Three Years' Duration).													
3 25	3 22	13 10	8 34	16	.....	4–5	2,737	2,915	.....	.....	30 26	19 27	10 93
3 92	.....	8 05	5 12	.....	.....	.....	.....	.....	.....	.....	.....	.....	−5 12
77	2 33	10 27	6 48	31	.....	4–5	2,000	2,375	.....	.....	28 35	18 06	11 53
7 94	5 55	31 42	.....	.....	.....	.....	.....	.....	.....	.....	58 61	.....	.....
1 68	1 18	.....	6 65	.....	.....	.....	.....	.....	.....	.....	.....	12 44	5 79
(Six Years' Duration).													
3 37	94	12 60	10 08	54	.....	4–5	800	730	2,180	.....	19 63	15 70	5 62
3 24	.....	9 15	7 32	.....	.....	.....	.....	.....	.....	.....	.....	.....	−7 32
32	1 80	5 90	10 00	18	.....	3½	1,515	1,650	.....	.....	16 80	28 47	18 47
1 44	.....	6 36	9 64	.....	.....	3	.....	.....	4,460	.....	22 30	33 79	24 15
3 26	3 41	14 45	11 56	18	.....	4–5	2,900	2,990	.....	.....	31 99	25 52	13 96
2 78	.....	8 72	6 98	.....	.....	.....	.....	.....	.....	.....	.....	.....	−6 98
92	2 28	11 47	9 18	35	.....	4–5	1,950	3,040	.....	.....	27 52	22 02	12 84
15 33	8 43	68 65	.....	.....	.....	.....	.....	.....	.....	.....	118 24	.....	.....
2 04	1 12	.....	9 15	.....	.....	.....	.....	.....	.....	.....	.....	15 76	6 61

ROTATION "S"

Rotation Year	Crops.		Area.	Items of Expense								
				Rent and taxes.	Seed, twine and use of machinery.	Manual labour.		Horse labour (including teamster.)				
								Hours.				
						Hours.	Cost.	Single horse	2-horse team.	3-horse team.	4-horse team.	5 horse team.
	1912.	1913.	Ac.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
1st..	Rye pasture...	Summer-fallow	1·25	5 83	75						6¾	
2nd..	Summer-fallow	Corn	1·25	5 83	2 92	43½	8 22	7⅛			5	
3rd..	Corn	Wheat	1·25	5 83	3 10	1¼	35			1½		
4th..	Wheat	Summer-fallow	1·25	5 83	75	¾	13				11¼	
5th..	Summer-fallow	Wheat	1·25	5 83	3 00	1½	28			1¼		
6th..	Wheat	Oats	1·25	5 83	2 45	1½	28			1½	5½	
7th..	Oats	Summer-fallow	1·25	5 83	75	1	19				10¾	
8th..	Summer-fallow	Peas and oats	1·25	5 83	2 87	9½	1 88	1½	5¾	¾		
9th..	Peas and oats	Rye pasture...	1·25	5 83	1 50	1½	25		6½		5½	
	Aggregate		11·25	52 47	18 03		11 58					
	Average per acre			4 66	1 61		1 03					

ROTATION "T"

6th.	Alfalfa	Alfalfa	1·57	5 02	1 24	16½	3 10	8¾	5½			
7th.	Alfalfa	Alfalfa	1·57	5 02	1 24	2¾	49	4½	1⅛			
8th.	Alfalfa	Summer-fallow	1·57	5 02	94			9⅛	9		11½	
9th.	Summer-fallow	Roots	1·57	5 02	3 07	119	22 61				2½	
10th	Roots	Wheat	1·57	5 02	3 65	3½	67			1½	1¼	
1st..	Wheat	Summer-fallow	1·57	5 02	94	5⅝	17				7½	
2nd..	Summer-fallow	Wheat	1·57	5 02	3 83	2½	44			1½	¾	
3rd..	Wheat	Oats	1·57	5 02	2 93	1½	29			1½	1½	
4th..	Oats	Summer-fallow	1·57	5 02	1 24	1½	33	4½	4¾		5½	
5th..	Summer-fallow	Alfalfa	1·57	5 02	1 24	45	8 55	1½	1½			
	Aggregate		15·7	50 20	20 38		36 65					
	Average per acre			5 02	2 04		3 67					

(Nine Years' Duration).

IN RAISING CROP.							PARTICULARS OF CROP.						
							Weight.						
Value of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Hoed crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	Inch.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
3 08	.....	9 66	7 73	.....	.....	.....	.....	.....	.....	.....	.....	.....	−7 73
4 34	.....	21 31	17 05	.....	.....	3	.....	.....	28,397	.....	42 60	34 08	17 03
45	2 94	12 67	10 13	30	.....	4–5	2,500	4,630	.....	.....	35 65	28 50	18 39
5 36	.....	12 07	9 66	.....	.....	.....	.....	.....	.....	.....	.....	.....	−9 66
92	2 50	12 53	10 02	35	.....	4–5	2,140	3,255	.....	.....	30 16	24 13	14 11
3 15	2 54	14 25	11 40	22	.....	4–5	2,160	2,685	.....	.....	22 94	18 35	6 95
5 08	.....	11 85	9 48	.....	.....	.....	.....	.....	.....	.....	.....	.....	−9 48
2 80	.....	13 38	10 70	.....	.....	3	.....	.....	9,215	.....	46 08	36 80	26 10
4 85	.....	12 43	9 94	.....	.....	3	.....	.....	470	125¼ Pasture days	4 38	3 50	−6 44
30 03	7 98	120 15	.....	.....	.....	.....	.....	.....	.....	.....	181 81	.....	.....
2 67	89	.....	10 68	.....	.....	.....	.....	.....	.....	.....	.....	16 16	5 48

(Ten Years' Duration).

4 12	1 83	15 31	9 75	8 35	.....	3	110	.....	2,040	.....	67 54	43 03	33 28
1 62	1 58	9 95	6 33	6 28	.....	3	95	.....	.....	.....	47 50	30 25	23 92
5 56	.....	11 52	7 33	.....	.....	.....	.....	.....	.....	.....	.....	.....	−7 33
6 66	.....	37 36	23 80	05	.....	.....	.....	.....	.....	43,150	64 73	41 23	17 43
1 35	1 75	12 44	7 92	50	.....	4–5	1,500	2,580	.....	.....	21 29	13 50	5 58
3 44	.....	9 57	6 10	.....	.....	.....	.....	.....	.....	.....	.....	.....	−6 10
76	3 89	14 00	8 91	25½	.....	4–5	3,330	4,990	.....	.....	46 90	29 87	20 96
3 69	3 65	15 58	9 92	17	.....	4–5	3,100	3,425	.....	.....	34 43	21 29	11 37
5 27	.....	11 86	7 55	.....	.....	.....	.....	.....	.....	.....	.....	.....	−7 55
81	1 82	17 44	11 11	960	.....	3	109	.....	.....	.....	54 50	34 71	23 60
33 28	14 52	155 03	.....	.....	.....	.....	.....	.....	.....	.....	336 87	.....	.....
.....	1 45	.....	9 87	.....	.....	.....	.....	.....	.....	.....	.....	21 39	11 52

In the following table the chief items in connection with the above rotations are recorded:—

ROTATION EXPERIMENT—Cost of Operations, Value of Products and Profits.

Rotation.	Total cost per acre.	Total value per acre.	Net profit per acre, 1913.
	$ c.	$ c.	$ c.
"A" wheat continuously	7 74	14 44	6 70
"B" two years' duration	6 00	9 38	3 38
"C" three years' duration	6 65	12 44	5 79
"M" six years' duration	9 15	15 76	6 61
"S" nine years' duration	10 68	16 16	5 48
"T" ten years' duration	9 87	21 39	11 52

DATES OF SEEDING.

DATES OF SEEDING Marquis Wheat (non-irrigated) on Summer-fallow.

Size of plot.	Date sown.	Date ripe.	Yield per acre.	Average yield per acre for 2 years.
Acres.			Bush. Lb.	Bush. Lb.
1/60	April 3	August 2	30 30	27 45
"	April 11	August 4	29 30	26 45
"	April 21	August 6	33 00	28 00
"	May 2	August 8	39 30	31 30
"	May 12	August 16	39 00	30 00
"	May 22	August 23	42 30	*31 30
"	June 2	September 2	31 30	*28 30

*1912 crop frosted.

DATES OF SEEDING Banner Oats (non-irrigated) on Summer-fallow.

Size of plot.	Date sown.	Date ripe.	Yield per acre.	Average yield per acre for 2 years.
Acres.			Bush. Lb.	Bush. Lb.
1/60	April 3	August 4	83 28	76 11
"	April 15	August 3	87 12	77 7
"	May 2	August 3	79 14	78 18
"	May 16	August 13	82 32	88 8
"	June 2	September 2	69 24	78 3
"	*June 16			

*Crop frosted somewhat.

LETHBRIDGE.

DATES OF SEEDING Mensury Barley (non-irrigated) on Summer-fallow.

Size of plot.	Date sown.	Date ripe.	Yield per acre.	Average yield per acre for 2 years.
Acres.			Bush. Lb.	Bush. Lb.
1/60	April 3	July 30	35 00	30 23
"	April 15	July 30	31 12	29 18
"	May 2	July 31	38 6	35 15
"	May 16	August 4	38 36	32 23
"	June 2		43 6	36 12
"	June 16	September 2	40 00	40 00
"	*July 2			

*Crop frosted.

DATES OF SEEDING Flax (non-irrigated) on Summer-fallow.

Size of plot.	Date sown.	Date ripe.	Yield per acre.	Average yield per acre for 2 years.
Acres.			Bush. Lb.	Bush. Lb.
1/60	April 3	August 7	15 30	19 31
"	April 15	August 7	19 46	23 44
"	May 2	August 12	21 54	23 47
"	May 16	August 16	20 50	*23 17
"	June 2	August 29	17 48	*21 51
"	June 16	Crop destroyed by frost both years.		
"	July 2	Crop destroyed by frost both years.		

*1912 crop frosted.

RATES OF SEEDING PER ACRE.

As experiments with different amounts of seed per acre have been carried on for five years with wheat, oats and barley they were discontinued this year. The average results would indicate about the following amounts as the most profitable quantities to use:—

Spring wheat..... 60 to 75 pounds of seed per acre.
Oats..... 60 to 75 " " "

RATES OF SEEDING Red Fife Wheat (non-irrigated) on Summer-fallow.

Size of plot.	Rate of seeding per acre.	Date sown.	Date ripe.	Days to mature.	Yield per acre.		Average yield per acre for 5 years.	
Acres.	Lb.				Bush.	Lb.	Bush.	Lb.
1/20	15	April 7	August 15	130	14	00	12	24
"	30	" 7	" 7	122	20	40	17	8
"	45	" 7	" 11	126	21	20	21	16
"	60	" 7	" 5	120	22	20	21	48
"	75	" 7	" 6	121	25	10	22	58
"	90	" 7	" 6	121	24	40	22	44
"	105	" 7	" 6	121	24	00	23	46
"	120	" 7	" 5	120	20	50	22	34

RATES OF SEEDING Banner Oats (non-irrigated) on Summer-fallow.

Size of plot.	Rate of seeding per acre.	Date sown.	Date ripe.	Days to mature.	Yield per acre, 1913.		Average yield per acre for 5 years.	
Acres.	Lb.				Bush.	Lb.	Bush.	Lb.
1/20	15	April 9	August 6	119	67	22	47	22
"	30	" 9	" 6	119	73	18	54	16
"	45	" 9	" 5	118	74	24	57	2
"	60	" 9	" 5	118	78	8	59	1
"	75	" 9	" 5	118	80	20	59	25
"	90	" 9	" 4	117	64	24	52	27
"	105	" 9	" 4	117	72	32	54	32
"	120	" 9	" 4	117	72	12	50	18

RATES OF SEEDING Mensury Barley (non-irrigated) on Summer-fallow.

Size of plot.	Rate of seeding per acre.	Date sown.	Date ripe.	Days to mature.	Yield per acre.		Average yield per acre for 4 years.	
Acres.	Lb.				Bush.	Lb.	Bush.	Lb.
1/20	15	April 17	July 31	105	28	36	14	31
"	30	" 17	" 31	105	37	24	19	18
"	45	" 17	" 31	105	38	36	20	45
"	60	" 17	" 31	105	36	12	22	27
"	75	" 17	" 31	105	37	4	24	8
"	90	" 17	" 30	104	37	24	27	19
"	105	" 17	" 30	104	34	28	27	42
"	120	" 17	" 29	103	34	28	25	40

SOIL CULTURAL EXPERIMENTS.

The dry-land soil cultivation investigations incepted in 1911 were continued but as yet few of the experiments have shown any marked results. Some interesting points, however, have been brought out, which may be briefly mentioned.

PRAIRIE BREAKING.

In this experiment, the results have brought out nothing that has not before been fairly well demonstrated. They strongly support our contention that sowing crops immediately after breaking is unprofitable, and point out that the most advisable and practical method of procedure on new land is to break the sod in the spring and allow it to remain till the following season before cropping.

DEPTH OF PLOUGHING.

The plots ploughed 3 and 4 inches deep appeared to suffer from drouth before those ploughed 6 and 7 inches deep. Ploughing beyond the latter depth, however, seemed of no advantage.

TIME OF PLOUGHING.

One of the most striking results observed, because it happened almost without exception, was the fact that land ploughed in the fall gave poorer returns than that which was ploughed in the spring. Similar results have been obtained in previous years, but the difference has never been so marked as was the case this year. No doubt the dry winter with its scanty rainfall was, in a great measure, responsible for these results.

PART II.—THE IRRIGATED FARM.

The yields on the irrigated part of the Station were satisfactory on the whole, average crops being harvested.

ROTATIONS ON THE IRRIGATED LAND.

There are at the present time two rotations under test on the irrigated part of the Farm, "U" and "V," the latter being simply a field left in alfalfa continuously.

ROTATION "U."

First year.—Seeding alfalfa.
Second year.—Alfalfa hay.
Third year.—Alfalfa hay.
Fourth year.—Alfalfa hay.
Fifth year.—Alfalfa hay.
Sixth year.—Alfalfa hay.
Seventh year.—Hoed crop.
Eighth year.—Wheat.
Ninth year.—Oats.
Tenth year.—Barley.

ROTATION "V."

Alfalfa continuously.

In computing the tables set forth herewith values as given on page 156 have been used.

LETHBRIDGE.

ROTATION

Rotation Year.	Crops.		Area.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual labour.		Horse labour (including teamster). Hours.				
						Hours.	Cost.	Single horse	2-horse team	3-horse team	4-horse team	5-horse team
	1912.	1913.	Ac.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
3rd...	Alfalfa	Alfalfa	1	4 20	1 19	18 3/7	3 57	2 1/2	7 3/4		1/4	
2nd...	Alfalfa seeding	Alfalfa	1	4 20	1 19	16 1/4	3 09	1 3/4	5 1/4		1/4	
1st	Oats	Alfalfa	1	4 20	1 19	10 3/5	2 06	1/2	1 3/5		6 1/5	
10th..	Oats	Barley	1	4 20	1 90	5 1/2	98			3/5	5 1/5	
9th...	Wheat	Oats	1	4 20	2 05	5 3/5	1 06			1	6 3/5	
8th.	Potatoes	Wheat	1	4 20	2 67	10 1/2	2 06			1 1/5	3 1/2	
7th...	Alfalfa	Potatoes	1	4 20	15 40	162 3/5	30 94	6 1/2	17		16 1/2	
6th...	Alfalfa	Alfalfa	1	4 20	1 19	20 1/5	3 93	3 1/4	7 1/2		1/2	
5th...	Alfalfa	Alfalfa	1	4 20	1 19	21 3/5	4 06	3	8 3/5		1/2	
4th...	Alfalfa	Alfalfa	1	4 20	1 19	21 3/5	4 06	3	8 3/5		1/2	
	Aggregate		10	42 00	29 16		55 81					
	Average per acre			4 20	2 9		5 53					

ROTATION

	Alfalfa	Alfalfa	1·05	3 18	64	26 1/5	4 97	3 1/5	7 1/2		1/2	
	Aggregate											
	Average per acre			3 09	60		4 69					

LETHBRIDGE.

SESSIONAL PAPER No. 16

"U" (ten years' duration).

IN RAISING CROP.						PARTICULARS OF CROP.							
							Weight.						
Cost of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of Stubble.	Grain.	Straw.	Hay.	Hoed crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	Cts.	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
3 36	.....	12 32	12 32	.....	.....	3	.....	.....	9,165	.....	54 99	54 99	42 67
2 40	.....	10 88	10 88	.....	.....	3	.....	.....	5,815	.....	34 89	34 89	24 01
3 73	.....	11 18	11 18	.....	.....	.....	.....	.....	1,006	.....	6 00	6 00	−5 18
2 88	1 55	11 51	11 51	37	.....	3	1,475	1,385	.....	.....	16 13	16 13	4 62
3 35	2 98	13 64	13 64	19	.....	.....	2,530	2,560	.....	.....	27 86	27 86	14 22
2 05	3 71	14 69	14 69	28	.....	.....	3,160	5,270	.....	.....	32 88	32 88	18 19
16 68	.....	67 22	67 22	11	.....	.....	.....	.....	2,593	35,537	3 89 296 17	300 06	233 74
3 50	.....	12 82	12 82	.....	.....	3	.....	.....	9,385	.....	56 31	56 31	43 49
3 76	.....	13 20	13 20	.....	.....	3	.....	.....	11,075	.....	66 45	66 45	53 25
3 76	.....	13 20	13 20	.....	.....	3	.....	.....	11,075	.....	66 45	66 45	53 25
45 47	8 24	180 66	.....	.....	.....	.....	.....	.....	.....	.....	662 02	.....	.....
4 55	82	.....	18 06	.....	.....	.....	.....	.....	.....	.....	.....	66 20	48 14

"V" (alfalfa continuously).

3 25	.....	12 04	11 36	.....	.....	3	.....	.....	8,375	.....	50 25	47 41	34 90
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3 06	.....	.....	11 36	.....	.....	.....	.....	.....	.....	.....	.....	47 41	36 05

MEASUREMENT OF IRRIGATION WATER.

All the water used for irrigation was measured over a weir, and a record made by a Fteez self-registering instrument. An effort has always been made to ascertain the amounts of water used on each individual crop but, because of the large number of small fields, this has not always been feasible. The quantity of water used for the season was sufficient to cover the land to a depth of 1·525 feet. The depth of water on the land on the Station devoted to mixed crops for the season of 1913 may therefore be said to be 1·525 acre-feet. It should be stated in this connection that a continuous flow of a fixed amount was not used. Water was obtained from the main canal at such times, and in such quantities, as we desired.

The following table, giving details regarding dates and quantities of water used on an alfalfa field of 15¾ acres, may be of interest:—

Area of field.	Dates of Irrigation.	Amount of water used, i.e., depth of water applied.
15·75 acres	May 22–29	·664 feet.
	July 15–17	·754 "
	Sept. 25–27	·495 "

Total depth of water applied.....1·913 feet.
Average yield per acre of alfalfa.....4 tons 230 pounds.

The rainfall during the growing season was:—

April	0.52 inches.
May	1.70 "
June	4.70 "
July	1.29 "
August	1.93 "
Total	10.14

The alfalfa was cut twice, and the yield of hay was 4 tons 230 pounds per acre. The irrigation in September was applied for the benefit of the 1914 crop. If the rainfall in the spring of 1914 proves to be normal, probably no irrigation will be required before the first cutting is made.

EXPERIMENTAL STATION FOR CENTRAL ALBERTA, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

WEATHER CONDITIONS, 1913.

The seeding season opened on April 10. The weather during April and for the first ten days of May was both cool and dry, keeping growth in check. Afterwards, however, conditions were so favourable that by June 15 all crops on well prepared land were as far advanced as has been the case in any season since the establishment of the Station. Favourable weather continued until harvesting and threshing were concluded. Fair yields of grain of better than average quality were the rule.

Some Weather Observations taken at Lacombe Experimental Station, 1913.

Month.	Temperature F.			Total Precipitation.	Total Sunshine.
	Mean.	Highest.	Lowest.		
		°	°	Inches.	Hours.
January		45·3	−35·5	0·93	63·3
February		55·6	−28·6	1·15	103·2
March		52·1	−23·6	0·81	164·1
April		77·8	17·4	0·15	260·8
May		77·4	18·1	0·48	277·1
June		81·8	36·2	2·98	271·9
July		84·8	31·9	3·43	336·3
August		84·0	35·5	2·435	311·1
September		80·0	24·4	0·59	240·4
October		81·5	9·7	0·68	141·7
November		59·8	0·5	0·05	146·2
December		57·8	−13·	0·07	136·7
Total for year				13·755	2452·8
Total for 6 growing months, April to September				10·065	1617·6

YIELDS OF FIELD CROPS.

Though the yield of grain in field lots this year has not been high, the quality has been good.

AREAS AND YIELDS of Field Crops, Lacombe, 1913.

Variety.	Area.	Total yield.		Yield per acre.	
	Acres.	Bush.	Lb.	Bush.	Lb.
Banner oats	5·859	410	16	70	2
Abundance oats	33·0	1,776	31	53	29
Marquis wheat	11·104	517	30	44	57
O. A. C. No. 21 barley	6·0	150	00	25	00
Mensury barley	26·0	902	00	37	00

ROTATION OF CROPS.

While it is rather too early to draw definite conclusions as to the particular rotation best adapted to local conditions, it has been shown that a rotation which includes an application of barnyard manure and at least two years in hay or pasture, will insure heavier yields of grain during the years in which it is sown to these crops, than is possible where no rotation is followed other than continuous-grain growing. A rotation such as "K" or "L" described below, is well adapted to conditions as obtain in this district. The sod, by returning fibre to the soil, helps to prevent blowing, increases its water holding capacity and improves its physical condition. The moderate application of barnyard manure has a similar effect, and it is noticeable that crops on land so treated make greater headway, especially in the early stages, than those on equally rich soil where no manure has been used. Extremely heavy applications of manure, more particularly if it is coarse, may prove injurious the first year after its application, especially if the season happens to be dry. If comparatively fine manure is applied on sod in the fall after the first crop of hay is cut, beneficial results will certainly follow.

The following rotations are now under test, "N" reported upon last year having been dropped to make room for some new poultry buildings.

ROTATION "C."

First year.—Summer-fallow.

Second year.—Wheat.

Third year.—Wheat, or coarse grain.

ROTATION "K."

First year.—Hoed crop—peas—mixed grain.

Second year.—Wheat.

Third year.—Oats or barley. Seeded down per acre as follows: one-third, alsike clover 6 pounds and rye grass 10 pounds; one-third, alsike clover 6 pounds, alfalfa 6 pounds and timothy 3 pounds; one-third, alsike clover 2 pounds, red clover 6 pounds, timothy 2 pounds and rye grass 2 pounds.

Fourth year.—Hay. Manured in autumn, 12 tons per acre.

Fifth year.—Pasture.

Sixth year.—Pasture. Ploughed July after haying, in preparation for roots.

LACOMBE.

ROTATION "L."

First year.—Hay.

Second year.—Pasture. Manured in autumn, 12 tons per acre.

Third year.—Pasture. Break July, for fall wheat.

Fourth year.—Grain. Winter wheat, or, in case of failure, spring wheat.

Fifth year.—Oats.

Sixth year.—Barley. Seeded down with 4 pounds timothy, 4 pounds alsike and 4 pounds red clover per acre.

ROTATION "O."

First year.—Hoed crops, or peas and oats mixed, cut early, and land disced and cultivated in fall.

Second year.—Wheat.

Third year.—Oats.

Fourth year.—Summer-fallow.

Fifth year.—Barley. Seeded down with 3 pounds timothy, 2 pounds alsike and 6 pounds alfalfa per acre.

Sixth year.—Hay. Manured in fall 6 tons per acre.

Seventh year.—Pasture. Portion intended for roots the following year to be ploughed early July.

The following tables contain details in connection with the above rotations for 1913. In computing the results fixed values as given on page 156 of this report have been used.

ROTATION

Rotation Year	Crops. 1912.	Crops. 1913.	Area.	Items of Expense: Roots and manure.	Seed, twine and use of machinery.	Manual labour. Hours	Manual labour. Cost.	Horse labour (including teamster) Hours. Single horse.	2-horse team.	3-horse team.	4-horse team.	5-horse team.
			Ac.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	No.
1st...	Barley	Wheat	1	2 00	2 60	2¼	0 52		1½	½		
2nd...	Barley	Summer-fallow	1	2 00	0 60				12½			
3rd...	Summer-fallow	Wheat	1	2 00	2 72	1	0 76		4	¾	½	
	Aggregate		3	6 00	5 92		1 28					
	Average per acre			2 00	1 97		0 43					

ROTATION

4th...	Barley seeded down	Hay	3·909	15 64	7 23	19¾	3 75					
5th...	Hay	Pasture	3·909	15 64	5 87				16½			
6th...	Pasture	Pasture	3·909	15 64	5 87							
1st...	Pasture	Hoed crop	3·909	15 64	30 72	230½	43 79	7¼	72		22	
2nd...	Hoed crop	Wheat	3·909	15 64	10 45	8¼	1 57		8		4½	
3rd...	Wheat	Barley seeded down	3·909	15 64	7 32	6¼	1 19		8½	3	14½	
	Aggregate		23·45	93 84	67 46		50 30					
	Average per acre			4 00	2 88		2 14					

ROTATION

3rd...	Pasture	Pasture	1·74	6 96	2 39	2¼	0 52		4½			
4th...	Pasture	Wheat	1·74	6 96	4 65	3¼	0 62		2½		2½	
5th...	Wheat	Oats	1·74	6 96	3 40	1¼	0 24		3¼	1¼	8¼	
6th...	Oats	Barley seeded down	1·74	6 96	3 53	1½	0 28		4½		7½	
1st...	Barley seeded down	Hay	1·74	6 96	3 08	3¼	0 62		5½			
2nd...	Hay	Pasture	1·74	6 96	2 39	1¼	0 24		3			
	Aggregate		10·44	41 76	19 44		2 52					
	Average per acre			4 00	1 86		0 24					

ROTATION

4th...	Oats	Green feed	3·210	9 18	17 89	9¼	1 84		4	3	8½	
5th...	Summer-fallow	Barley seeded down	2·727	7 79	6 24	15	2 85		7¼	3¼		
6th...	Barley seeded down	Hay	3·202	9 33	6 91	16	3 04		9½			
7th...	Hay	Pasture	4·119	11 78	8 51							
1st...	Pasture	Hoed crop	4·119	11 78	20 01	275½	51 92	43½	87½		4½	
2nd...	Hoed crop	Wheat	4·119	11 78	11 46	11¼	2 14		8		6	
3rd...	Wheat	Oats	4·119	11 78	7 96	10	1 90		5		17½	
	Aggregate		25·675	73 42	78 98		63 69					
	Average per acre			2 86	3 08		2 48					

SESSIONAL PAPER No. 16

"C" (three years' duration).

IN RAISING CROP.							PARTICULARS OF CROP.						
							Weight.						
Value of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Cost for 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Hoed crop.	Total value.	Value of crop per acre.	Profit or loss per acre.
$ c.	$ c.	$ c.	$ c.	Cts.	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
0 71	1 45	7 28	7 28	35			1,240	3,965			18 51	18 51	11 23
4 25		6 85	6 85										−6 85
1 91	3 03	10 42	10 42	24			2,600	5,675			37 50	37 50	27 08
6 87	4 48	24 55									56 01		
2 29	1 49		8 18									18 67	10 49

"K" (six years' duration).

		32 31	8 27						13,240		66 22	16 94	8 67
5 69		24 51	5 50								2 63	0 67	−4 83
		21 51	5 50								2 86	0 73	−4 77
37 68		127 83	32 70						14,762	32,130	341 56	87 38	54 68
4 88	10 41	42 95	10 99	28·8			8,920	18,975			128 42	32 85	21 86
11 19	5 50	40 84	10 45	37·1			5,280	8,380			61 18	15 65	5 20
59 44	15 91	286 95									602 87		
2 53	0 68		12 23									25 70	13 47

"L" (six years' duration).

1 53		11 40	6 55						4,210		21 68	12 46	5 91
8 73	2 49	23 45	13 48	65·9			2,135	5,805			31 37	18 03	4 55
5 98	3 87	20 45	11 75	20·6			3,287	6,373			39 24	22 55	10 80
5 20	2 35	18 33	10 53	39·0			2,256	3,181			25 74	14 79	4 26
1 95		12 61	7 25						6,450		32 25	18 53	11 28
1 02		10 61	6 10						1,060		6 17	3 55	−2 55
24 42	8 71	96 85									156 45		
2 34	0 83		9 27									14 98	5 71

"O" (seven years' duration).

6 59		35 50	11 06						9,028		45 14	14 06	3 00
3 79	3 90	24 57	9 01	31·5			3,744	17,136			54 64	20 04	11 03
3 23		22 51	6 90						10,785		53 93	16 54	9 64
		20 29	4 93								4 28	1 04	−3 87
43 85		127 56	30 97							57,432	140 91	34 21	3 24
5 60	14 35	45 33	11 00	22·1			12,300	21,451			174 73	42 42	31 42
10 10	12 55	44 29	10 78	14·0			10,670	16,790			123 49	29 98	19 26
73 16	30 80	320 05									597 12		
2 85	1 20		12 47									23 26	10 79

FANNED *VERSUS* NOT FANNED WHEAT FOR SEED.

An interesting experiment has been conducted with fanned and not fanned Marquis wheat for seeding purposes. The results indicate the importance of a careful grading of all seed grain.

Wheat fanned twice yielded	38	bush.	00	lb. per acre.
Wheat fanned once yielded	26	"	50	" "
Wheat not fanned yielded	24	"	00	" "

SOIL CULTURAL EXPERIMENTS.

A series of soil cultivation experiments is being conducted and, as far as it has been possible to judge, the yields have not been influenced other than by the treatment given. Among the experiments conducted, the following are those considered conclusive enough to be reported upon:—

DEPTH OF PLOUGHING.

A. Ploughing on wheat stubble to be sown to oats.
B. Ploughing for summer-fallow.
C. Ploughing on sod.

The deep working of the land in the summer-fallow year did not appear to give any special results on the first succeeding crop (wheat) but influenced favourably the second crop (oats).

In the breaking out of sod, ploughing at a depth of five inches gave better results than at 3 or 4 inches. This practice also proved superior, this year, to breaking sod 3 inches and ploughing the wheat stubble 6 inches for the following oat crop.

SUMMER-FALLOW TREATMENT.

In the experiment with methods of summer-fallowing, the following points have been indicated:—

1. That it is of advantage to plough summer-fallow but once.
2. That deep ploughing gives better results than shallow ploughing.
3. That working or ploughing the stubble land in the fall previous to the summer-fallow does not always result in increased yields.

STUBBLE TREATMENT.

The fall or spring ploughing of stubble land proved better practice than the burning of the stubble in spring, and then seeding.

SEEDING TO GRASS AND CLOVER.

When the seeding of grass is made with a nurse crop, the yield of hay is increased, but the increase is not sufficient to compensate for the loss of crop sustained when seeding alone.

LACOMBE.

CLEARING AND BREAKING.

About 15 acres of the more heavily timbered portion of the newly purchased farm have been cleared, and broken by means of a steam plough. The engine drew two 24-inch brush breakers and cut a clean and well-turned furrow, considering that many of the roots encountered measured twelve inches or more across. Another 6-acre area has been brushed, cleared and broken by horse-power.

FENCING.

About 6½ miles of woven wire fence were erected during the season, the style for the most part being a nine-wire 52-inch fence, ten stays to the rod, number nine gauge wire throughout. A few other styles were also erected so that comparisons may be made.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

FIELD CROPS.

In the spring of 1911 practically the entire Farm was put down to a four-year rotation, namely:—

First year.—Hoed crop of corn, roots or potatoes.

Second year.—Grain. Seeded down.

Third year.—Clover hay.

Fourth year.—Pasture.

With the increase of barnyard manure, the results from each new section planted to hoed crops have shown an improvement.

The hoed crops this season were grown on a piece of land from which, since 1910, orchards have been removed from time to time. A part of the area is badly infested with couch grass, and another portion suffers somewhat from shading, due to its location between the mountains on the north and a section of Douglas fir trees on the south. Notwithstanding this, the yields have been fair. In all, there were harvested 284 tons 1,770 pounds of silage corn, 136 tons 110 pounds of mangels, 9 tons 1,980 pounds of carrots, 6 tons 100 pounds of sugar beets, 16 tons 1,500 pounds of potatoes, and 10 tons 800 pounds of turnips, making a total hoed crop yield of 464 tons 260 pounds.

Two varieties each of corn and mangels were grown as field crops, namely: Longfellow and Compton's Early corn and Giant Half Sugar White and Perfection Mammoth Long Red mangels. Regarding the corn, the sorts grown give the best results of any of the varieties grown to date. With regard to the mangels, we are not in a position to make this statement with such assurance as yet, because several of the varieties now being tested give promise of greater yields per acre.

The mangels were planted at the rate of 9 pounds per acre in drills, 30 inches apart. These drills were set up with a double mould board plough, rolled and the seed sown with a hand drill. This rate of planting gave, at the time of the two-leaf stage, a perfect stand. Where fertilizer tests were not carried on, there were sown in the drills, at drilling time, 600 pounds per acre of a mixture of chemical fertilizers, consisting of 350 pounds superphosphate, 150 pounds muriate of potash and 100 pounds nitrate of soda. For the last two years the mangels, when treated this way, have grown faster than the average weeds. When once up and growing nicely they were hoed by hand with a small wheel hoe. They were thus easily and cheaply kept above the weeds, and the horse cultivator did the rest until thinning time. They were thinned about 14 inches apart and hoed but once thereafter.

Because the field was badly overrun with couch grass, a great deal of preparation was required for the corn land. Many harrowings were given with the drag type of harrow, for too much cutting only defeated our aims. Barnyard manure was ploughed in at the rate of 16 tons per acre. The corn was planted by

machine in checks 3 feet apart each way, for this distance has proven the most advantageous for this district in getting good silage results. The land was harrowed with a drag harrow twice before the corn came up, to keep down the corn spurrey. After the last cultivation with a two-horse two-rowed cultivator (except the finishing off, for which we used the single walking scuffler), it was hand hoed once. In harvesting, the corn was bound and hauled on low-wheeled wagons. The total cost in the silo was $2.73 per ton.

BARNYARD MANURE.

COMMERCIAL FERTILIZER ALONE *versus* COMMERCIAL FERTILIZER TOGETHER WITH BARNYARD MANURE FOR MANGELS.

In order to ascertain the value of barnyard manure for mangels, an experiment was begun using a mixture of commercial fertilizer only on one plot, and the same mixture, together with 16 tons per acre of barnyard manure on a second plot. While the second plot yielded over 3 tons per acre more mangels than the first, the manure could not be considered as having entirely paid for itself from the first crop after application. The yields of succeeding crops must, of course, be considered before the full value of the manure will be known.

COMMERCIAL FERTILIZER alone *versus* Commercial Fertilizer together with Barnyard Manure.

Plot.	Fertilizers.		Yield of mangels per acre.	Cost of fertilizers.	Value of crop per acre less cost of fertilizers.
	Barnyard manure.	Commercial fertilizers.			
			Tons. Lb.	$ cts	$ cts.
1	16 tons, fresh, applied in spring.....	Superphosphate, 350 lb.; muriate of potash, 150 lb.; nitrate of soda, 100 lb.....	26 1820	24 42	56 30
2		Superphosphate, 350 lb.; muriate of potash, 150 lb.; nitrate of soda, 100 lb.....	23 1550	8 42	62 90

SPRING APPLICATION *versus* WINTER APPLICATION OF FRESH MANURE.

In this very wet winter climate it is thought there may be undue loss through the leaching of barnyard manure applied in the fall or winter. An experiment to learn the probable extent of this loss has been conducted during the past season. The results, as tabulated below, favour spring application.

Further tests, verifying these results, must be made, before accepting them as conclusive.

AGASSIZ.

SPRING APPLICATION *versus* Winter Application of Fresh Manure.

Plot.	Fertilizers.		Yield of mangels per acre.	Cost of fertilizers.	Value of crop per acre less cost of fertilizers.
	Barnyard manure.	Commercial fertilizers.			
			Tons. Lb.	$ cts.	$ cts.
1	16 tons, fresh, applied in winter....	Superphosphate, 350 lb.; muriate of potash, 150 lb.; nitrate of soda, 100 lb.....	25 1000	24 42	52 07
2	16 tons, fresh, applied in spring....	Superphosphate, 350 lb.; muriate of potash, 150 lb.; nitrate of soda, 100 lb.....	26 1820	24 42	56 30

WINTER APPLICATION OF MANURE (FRESH) *versus* SPRING APPLICATION (STACK).

In this experiment, 16 tons per acre of manure were weighed and hauled on the plot in the winter and left in the stack, to be spread in the spring. The other plot received fresh manure direct from the yard in the spring. Spring application again produced a somewhat heavier yield of mangels, but results will be accepted as final only after further verification.

APPLICATION of Fresh Manure in Winter *versus* Application from Stack in Spring.

Plot.	Fertilizers.		Yield of mangels per acre	Cost of fertilizers.	Yield of crop per acre less cost of fertilizers.
	Barnyard manure.	Commercial fertilizers.			
			Tons. Lb.	$ cts.	$ cts.
1	16 tons, fresh, applied in winter....	Superphosphate, 350 lb.; muriate of potash, 150 lb.; nitrate of soda, 100 lb.....	25 1000	24 42	52 07
2	16 tons, from stack, applied in spring..	Superphosphate, 350 lb.; muriate of potash, 150 lb.; nitrate of soda, 100 lb.....	25 1780	24 42	53 24

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM THE

DIVISION OF ANIMAL HUSBANDRY

ON

BEEF CATTLE, DAIRY CATTLE AND DAIRYING, HORSES, SHEEP AND SWINE

FOR THE FISCAL YEAR ENDING MARCH 31, 1914

PREPARED BY

The Dominion Animal Husbandman, Ottawa, Ont. - - - - E. S. Archibald, B.A., B.S.A.
Superintendent—
Experimental Station, Charlottetown, P.E.I. - - - - J. A. Clark, B.S.A.
Experimental Farm, Nappan, N.S. - - - - - - - - W. W. Baird, B.S.A.
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Experimental Station, Fredericton, N.B. - - - - - - W. W. Hubbard.
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Experimental Farm, Indian Head, Sask - - - - - - T. J. Harrison, B.S.A.
Experimental Station, Scott, Sask. - - - - - - R. E. Everest, B.S.A.
Experimental Station, Rosthern, Sask. - - - - - Wm. A. Munro, B.A., B.S.A.
Experimental Station, Lacombe, Alta. - - - - - - - G. H. Hutton, B.S.A.
Experimental Station, Lethbridge, Alta. - - - - - - W. H. Fairfield, M.S.
Experimental Farm, Agassiz, B.C. - - - - - - - - P. H. Moore, B.S.A.

REPORT

FROM THE

DIVISION OF ANIMAL HUSBANDRY.

OTTAWA, March 31, 1914.

J. H. GRISDALE, Esq., B.Agr.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith reports upon the beef cattle, dairy cattle and dairying operations, horses, sheep, and swine on the Central Experimental Farm and branch Farms and Stations for the past year.

On October 11, 1914, this Division suffered severely at the Central Experimental Farm in the loss of the main dairy barn, calf, bull and steer barns by fire. This necessitated the discontinuing of many lines of work at this Farm, not only with Dairy and Beef cattle, but also with other classes of stock, as all remaining buildings were crowded to their limit. With the completion of the new buildings, now under construction, all such postponed work will be continued.

For help in preparing and compiling a large proportion of the data contained in the text of the Central Farm report, I am indebted to Mr. G. B. Rothwell. The conducting of work and reporting results of such work on the branch Farms and Stations have been in the hands of the Superintendents of those Farms and Stations.

In work with swine, both breeding and feeding, on the Central Experimental Farm, Mr. D. D. Gray, farm foreman, deserves special credit for the very efficient manner in which he conducted the various operations and retained careful and accurate records of same.

The work of keeping breeding and sales records for the Central Experimental Farm, and also the registration work for all Dominion Experimental Farms, has been most efficiently performed by Mr. G. B. Rothwell.

To Mr. Jos. Meilleur, dairyman at the Central Farm, I am indebted for excellent work and careful records in his department.

To Mr. Robt. Cunningham, herdsman, I am indebted for constant and efficient care of stock and for interest and assistance in new work, as well as the satisfactory performance of the routine work in connection with all classes of cattle.

To my secretary, Mr. O. Johnson, I am indebted for efficiency and diligence in office work, which includes heavy correspondence and the keeping records tabulated and filed.

Attention is drawn to the fact that all feeding experimental work is conducted in co-operation with the Division of Chemistry. Readers are referred to the report of the Dominion Chemist, Mr. F. T. Shutt, in which are contained the analyses of all foodstuffs being fed experimentally.

During the year I have attended many meetings, and judged at various exhibitions, in addition to my regular duties on the Central Experimental Farm. I have also visited each of the branch Farms and Stations in the Eastern Provinces where live stock work is being conducted or is anticipated, but owing to the losses by fire at Ottawa, was compelled to postpone visiting the western Farms.

I have the honour to be, sir,
Your obedient servant,

E. S. ARCHIBALD,
Dominion Animal Husbandman.

BEEF CATTLE.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN
E. S. ARCHIBALD, B.A., B.S.A.

As reported previously, no breeding herds of beef cattle have been maintained on the Central Experimental Farm since the removal, in 1911, of the Shorthorn herd from Ottawa to the branch Farm at Brandon, Man., this owing to lack of pasture, forage crops, and buildings necessary for such work.

BEEF EXPERIMENTAL FEEDING.

Previous experiments have clearly demonstrated the fact that stall feeding of stockers and thin butcher cattle during summer months as a rule leaves little if any profit. Hence during the past year no work was undertaken in the summer months. In the early part of September a good bunch (thirty head) of 2-year-old stockers was purchased preparatory to winter feeding experiments. These were dehorned and tuberculin tested at once, and maintained on a preparatory feeding period during the last two weeks of that month. On October 1 three experiments were started, comparing three grain rations with and without molasses and molasses meals. These experiments promised interesting and valuable data, but unfortunately had to be discontinued owing to the destruction of the steer barn by fire.

However, at that time the Superintendent of the Experimental Farm at Nappan, N.S., was commencing steer purchases for experimental feeding, and it was considered advisable to ship this lot of steers from Ottawa and incorporate some of the features of the started experiment in the work at that Farm. See report of the Superintendent, Experimental Farm, Nappan, N.S.

It is hoped that such work may be re-established on this Farm during the coming year, in temporary quarters, and that in the near future ample accommodation may be provided for this most important line of work.

FINANCIAL STATEMENT FOR BEEF CATTLE.

Below are submitted inventories and returns for beef cattle on the Central Experimental Farm during the year April 1, 1913, to March 31, 1914.

RETURNS.

By sale of ten finished steers	$ 909 38	
By sale of fattened cows	178 45	
By sale of twenty-four steers to Experimental Farm, Nappan	1,909 25	
By manure, 240 tons at $1	240 00	
Gross returns		$3,237 08

EXPENDITURES.

To feed consumed by steers and fattening cows	$ 265 10	
To twenty-eight steers purchased September 12, 1913, at $7 a cwt.	2,199 75	
To value of steers and fattening cows April 1, 1913	454 30	
To labour with beef animals	205 00	
Gross expenditure		3,124 15
Net balance from beef cattle		112 93

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

BEEF CATTLE.

The work with beef cattle at this Station was limited to steer feeding.

Feeders of a good beef type were very scarce and rather thin in flesh in the autumn of 1913. The cattle were mostly grades of various breeds and were purchased and marketed at the ruling market prices. They were dehorned and allowed to run on rape with shelter and hay at night, during part of November, at a cost per steer per month of $1.73. The meal mixture cost $25 per ton and was made up as follows:—

Oats (ground)	Lb.	43
Barley (ground)	"	43
Peas	"	14

The bran cost $25 per ton and was mixed as fed, some pens requiring more than others.

Roots were valued at $2 per ton.

Hay (mixed clover and timothy) was valued at $7 per ton.

The test started on December 1, 1913, with sixteen head.

The following is a detailed statement of the different lots fed:—

LOT I.

The steers in the first pen were in good condition. They were Holstein and Shorthorn grades which, at the date of sale, would be about 2 years and 9 months old.

Number of steers in lot		4
First weight, gross	Lb.	3,810
First weight, average	"	952½
Finished weight, gross	"	4,400
Finished weight, average	"	1,100
Total gain in eighty days	"	590
Average gain per steer	"	147½
Daily gain per steer	"	1.84
Daily gain per lot	"	7.37
Gross cost of feed	$	73 19
Cost of one pound gain	Cts.	12.4
Value of beef at the beginning, 3,810 pounds at 4.73 cents	"	253 31
Total cost to produce beef	"	286 00
Selling price at 6½ cents per pound	"	33 29
Profit	"	8 32
Profit per steer	"	15 63
Average valuation of steer at start	"	71 50
Average value price at finish	"	26 47
Average increase in value	"	18 29
Average cost of feed per steer	"	3,295
Amount of meal eaten by lot (crushed grain, 1,450, bran, 1,845)	Lb.	19,805
Amount of roots eaten by lot	"	3,486
Amount of hay eaten	"	

LOT II.

These were two steers of good beef type and one pure-bred Shorthorn heifer. They were in good thrifty condition and were about 3 months younger on the average than lot 3.

Number of cattle in lot		3
First weight, gross	Lb.	2,625
First weight, average	"	875
Finished weight, gross	"	3,285
Finished weight average	"	1,095
Total gain in 106 days	"	660
Average gain per animal	"	220
Daily gain per animal	"	2·075
Daily gain per lot	"	6·225
Gross cost of feed	$	67 52
Cost of 1 pound gain	Cts.	10·23
Value of beef at beginning, 2,625 pounds at 4·83 cents	$	126 99
Total cost to produce beef	"	194 51
Selling price at 7½ cents per pound	"	246 37
Profit	"	51 86
Profit per animal	"	17 29
Average valuation of animal at start	"	42 33
Average value price at finish	"	82 12
Average increase in value	"	39 79
Average cost of feed per animal	"	22 51
Amount of meal eaten by lot (crushed grain, 1,374; bran, 1,704)	Lb.	3,081
Amount of roots eaten by lot	"	18,320
Amount of hay eaten by lot	"	3,053

LOT III.

These were two Hereford grades about 3 years old at date of sale, and one Shorthorn grade just 2 years old when sold. The Hereford grades were very thin at the beginning and at the close were shown in the Easter market by the butcher.

Number of steers in lot		3
First weight, gross	Lb.	2,425
First weight, average	"	808
Finished weight, gross	"	3,145
Finished weight, average	"	1,048
Total gain in 128 days	"	720
Average gain per steer	"	240
Daily gain per steer	"	1·875
Daily gain per lot	"	5·625
Gross cost of feed	$	88 95
Cost of one pound gain	Cts.	12·35
Value of beef at beginning, 2,425 pounds at 5·26 cents	$	127 65
Total cost to produce beef	"	216 60
Selling price at 7½ cents per pound	"	235 87
Profit	"	19 27
Profit per steer	"	6 42
Average valuation of steer at start	"	42 55
Average value price at finish	"	78 62
Average increase in value	"	36 07
Average cost of feed per steer	"	29 65
Amount of meal eaten by lot (crushed grain, 2,272; bran, 2,183)	Lb.	4,455
Amount of roots eaten by lot	"	21,758
Amount of hay eaten by lot	"	3,286

LOT IV.

These were two Hereford grades and one Ayrshire grade all about 3 years old at date of sale. The lot were all thin when started. They were fed all the meal mixture they would stand from start to finish.

Beef Production.—Lot IV.

Number of steers in lot		3
First weight, gross	Lb.	2,335
First weight, average	"	778
Finished weight, gross	"	3,230
Finished weight, average	"	1,077
Total gain in 134 days	"	895
Average gain per steer	"	298
Daily gain per steer	"	2·226
Daily gain per lot	"	6·678
Gross cost of feed	$	98 64
Cost of one pound gain	Cts.	11·021
Value of beef at beginning, 2,335 pounds at 5·6 cents	$	130 78
Total cost to produce beef	"	229 42
Selling price at 7½ cents per pound	"	242 25
Profit	"	12 83
Profit per steer	"	4 28
Average valuation of steer at start	"	43 59
Average value price at finish	"	80 75
Average increase in value	"	37 16
Average cost of feed per steer	"	32 88
Amount of meal eaten by lot (crushed grain, 2,519; bran, 2,492)	lb.	5,011
Amount of roots eaten by lot	"	23,680
Amount of hay eaten by lot	"	3,520

LOT V.

These were two dairy type steers and one pure-bred Shorthorn steer. They were young and thrifty, averaging about 2 years old when sold.

Number of steers in lot		3
First weight, gross	Lb.	2,175
First weight, average	"	725
Finished weight, gross	"	2,900
Finished weight, average	"	967
Total gain in 151 days	"	725
Average gain per steer	"	242
Daily gain per steer	"	1·6
Daily gain per lot	"	4·8
Gross cost of feed	$	89 80
Cost of one pound gain	Cts.	12·35
Value of beef at beginning, 2,175 pounds at 4·775 cents	$	103 84
Total cost to produce beef	"	193 67
Selling price, 2,900 pounds at 7½ cents	"	210 25
Profit	"	16 58
Profit per steer	"	5 52
Average valuation of steer at start	"	34 62
Average value price at finish	"	70 08
Average increase in value	"	35 46
Average cost of feed per steer	"	29 93
Amount of meal eaten by lot (oats, etc., 2,169; bran, 1,971)	Lb.	4,130
Amount of roots eaten by lot	"	24,591
Amount of hay eaten by lot	"	3,883

Deductions.—Only deductions of a general nature may be drawn from these feeding tests where the types of animals and the number of days of test vary so greatly. However, the following points are of interest:—

(1) Steers fed quickly give a good margin of profit.

(2) The type of steer that is sold as feeders throughout the province, although conforming more to the dairy than the beef type, may be profitably finished in from three to five months, according to age.

(3) Many steers slaughtered in November and December would pay good profitable returns if fed a few months longer.

CHARLOTTETOWN.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

EXPERIMENT WINTER OF 1913-14.

Twenty-four steers were purchased from the Central Farm, Ottawa, in October, 1913, costing 7 cents f.o.b. Freight charges on the twenty-four steers were $62.88, making the total cost of steers when landed here $7.23 per hundred, live weight.

All were well-bred grade Shorthorns, and twelve were in such a condition as would class them as good butchers. The remaining twelve were slightly thinner and could be ranked as good stockers. Four more good grade steers were purchased locally at 4¾ cents per pound and were in sufficiently good flesh to be classed as good butcher cattle.

The twenty-eight steers then were divided into two main lots, namely, sixteen good butchers and twelve good stockers; these in turn were divided into sublots for feeding as follows:—

Lot 1, six steers, good butchers.
Lot 2, six steers, good stockers.
Lot 3, six steers, good butchers.
Lot 4, six steers, good stockers.
Lot 5, four steers, good butchers.

These were fed as follows:—

Lot 2 were fed 50 per cent more roots and meal than lot 4.
Lot 3 were fed 50 per cent more roots and meal than lot 1.
Half of lot 1 were fed 2 pounds molasses per day per steer during period.
Other half of lot 1 were fed none.
Half of lot 2 were fed 2 pounds molasses per day per steer during period.
Other half of lot 2 were fed none.
Half of lot 3 were fed 2 pounds of molasses per steer per day during period.
Other half of lot 3 were fed none.
Half of lot 4 were fed 2 pounds molasses per steer per day during period.
Other half of lot 4 were fed none.
Lot 5 were fed same roughage as lot 1 but replaced 2 pounds of meal with molasses.

All steers had a preparatory feeding period from November 3 to 17 to allow them to become accustomed to their feed and surroundings.

STEER FEEDING EXPERIMENT AT NAPPAN, FROM NOVEMBER 17, 1913, TO MARCH 30, 1914.

Comparison of Lots 1 and 3, Good Butchers, Heavy fed *vs.* Light fed.

		Lot 1. 6 steers. "Light Fed"	Lot 3. 6 steers. "Heavy Fed"
Total live weight of steers, Nov. 17, 1913	lb.	7,155	6,885
Total live weight of steers, March 31, 1914	lb.	8,945	8,765
Increase to March 31, 1914	lb.	1,790	1,880
Lot 1—			
Original weight of 6 steers, 7155 pounds, at 7·23 cents	$	517·30	
Weight at finish of 6 steers, 8,945 pounds at 9 cents	$	805·05	
Lot 3—			
Original weight of 6 steers, 6,885 pounds at 7·23 cents	$		497·78
Weight at finish of 6 steers, 8,765 pounds at 9 cents	$		788·85
Gross profit	$	287·75	291·07
Amount of hay consumed	lb	11,970	11,970
Amount of meal consumed	lb.	3,528	5,292
Amount of roots consumed	lb.	30,660	45,990
Amount of molasses consumed	gal.	55	55
Cost of feed for lot for 133 days	$	135·40	173·66
Net profit	$	152·35	117·41
Daily rate of gain per steer	lb.	2,243	2,355
Cost of 1 pound gain	cts.	7·56	9·24
Cost of feed per day per steer	cts.	16·96	21·76
Profit per steer	$	25·39	19·57

STEER FEEDING EXPERIMENT AT NAPPAN FROM NOVEMBER 17, 1913, TO MARCH 30, 1914.

Comparison of Lots 2 and 4, Good Stockers, Heavy fed *vs.* Light fed.

		Lot 2. 6 steers "Heavy Fed"	Lot 4. 5 steers "Light Fed"
Total live weight of steers, Nov. 17, 1913	lb.	6,655	5,790
Total live weight of steers, March 31, 1914	lb.	8,490	7,205
Increase to March 31, 1914	lb.	1,835	1,415
Lot 2—			
Original weight of 6 steers, 6,655 pounds at 7·23 cents	$	481·15	
Weight at finish of 6 steers, 8,490 pounds at 9 cents	$	764·10	
Lot 4—			
Original weight of 5 steers, 5,790 pounds at 7·23 cents	$		418·61
Weight at finish of 5 steers, 7,205 pounds at 9 cents	$		648·45
Gross Profit	$	282·95	229·84
Amount of hay consumed	lb.	11,970	9·975
Amount of meal consumed	lb.	5,292	2,940
Amount of roots consumed	lb.	45,990	25,550
Amount of molasses consumed	gal.	55	55
Cost of feed for lot for 133 days	$	173·66	114·67
Net profit	$	109·29	115·17
Daily rate of gain per steer	lb.	2·299	2·127
Cost of 1 pound gain	cts.	9·46	8·10
Cost of feed per day per steer	cts.	21·76	17·24
Profit per steer	$	18·21	23·03

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STEER FEEDING EXPERIMENT at Nappan from November 17, 1913, to March 30, 1914. Lot 5, Good Butchers, fed the same as Lot 1, except 2 pounds of meal which was replaced by molasses.

—		Lot 5. 4 steers "Good Butchers"	Lot 5, calculated on same basis as Lot 1.
Total weight of 4 steers, Nov. 21, 1913	lb.	4,535	4,535
Total weight of 4 steers, March 31, 1914	lb.	5,760	5,760
Increase to March 31, 1914	lb.	1,225	1,225
Original weight of steers, 4,535 pounds at 4·75 cents	$	215·41	327·88
Weight at finish of 4 steers, 5,760 pounds at 9 cents	$	518·40	518·40
Gross profit	$	302·99	190·52
Amount of hay consumed	lb.	7,560	7,560
Amount of meal consumed	lb.	19,320	19,320
Amount of roots consumed	lb.	1,596	1,596
Amount of molasses consumed	gal.	71	71
Cost of feed for lot for 126 days	$	84·50	84·50
Net profit	$	218·49	106·02
Daily rate of gain per steer	lb.	2·430	2·430
Cost of 1 pound gain	cts.	6·89	6·89
Profit per steer	$	54·62	26·50

STEER FEEDING EXPERIMENT at Nappan from November 17, 1913, to March 30, 1914. Comparison of sub-lots of Lot 1, Good Butchers, Light fed, Molasses *vs.* No Molasses.

—		½ Lot 1. 3 steers. Molasses.	½ Lot 1. 3 steers. No Molasses.
Total live weight of 3 steers Nov. 17, 1913	lb.	3,510	3,645
Total live weight of 3 steers March 30, 1914	lb.	4,440	4,505
Increase to March 30, 1914	lb.	930	860
Molasses—			
Original weight of three steers 3,510 pounds at 7·23 cents	$	253·77	
Weight at finish of 3 steers, 4,440 pounds at 9 cents	$	399·60	
No Molasses—			
Original weight of 3 steers, 3,645 pounds at 7·23 cents	$		263·53
Weight at finish of 3 steers, 4,505 pounds at 9 cents	$		405·45
Gross profit	$	145·83	141·92
Amount of hay consumed	lb.	5,985	5,985
Amount of meal consumed	lb.	1,764	1,764
Amount of roots consumed	lb.	15,330	15,330
Amount of molasses consumed	gal.	55	
Cost of feed for lot for 133 days	$	73·20	62·20
Net profit	$	72·63	79·72
Daily rate of gain per steer	lb.	2·330	2·155
Cost of 1 pound gain	cts.	7·87	7·23
Cost of feed per day per steer	cts.	18·34	15·59
Profit per steer	$	24·21	26·57

NAPPAN.

STEER FEEDING EXPERIMENT at Nappan from November 17, 1913, to March 30, 1914. Comparison of sub-lots of Lot 2, Good Stockers, Heavy Fed. Molasses *vs.* No Molasses.

	½ Lot 1. 3 steers. Molasses.	½ Lot 1. 3 steers. No Molasses.
Total live weight of 3 steers Nov. 17, 1913.....lb.	3,525	3,130
Total live weight of 3 steers March 30, 1914.....lb.	4,500	3,990
Increase to March 30, 1914.....lb.	975	860
Molasses—		
Original weight of three steers 3,525 pounds at 7·23 cents.....$	254·85	
Weight at finish of 3 steers, 4,500 pounds at 9 cents.....$	405·60	
No Molasses—		
Original weight of 3 steers 3,130 pounds at 7·23 cents.....$	.....	226·29
Weight at finish of 3 steers, 3,990 pounds at 9 cents.....$	.....	359·10
Gross profit.....$	150·15	132·81
Amount of hay consumed.....lb.	5,985	5,985
Amount of meal consumed.....lb.	2,646	2,646
Amount of roots consumed.....lb.	22,995	22,995
Amount of molasses consumed.....gal.	55	
Cost of feed for lot for 133 days.....$	92·32	81·32
Net profit.....$	57·83	51·49
Daily rate of gain per steer.....lb.	2·443	2·155
Cost of 1 pound gain.....cts.	9·46	9·45
Cost of feed per day per steer.....cts.	23·13	20·38
Profit per steer.....$	19·27	17·16

STEER FEEDING EXPERIMENT at Nappan from November 17, 1913, to March 30, 1914. Comparison of sub-lots of Lot 3, Good Butchers, Heavy Fed. Molasses *vs.* No Molasses.

	Half Lot 3. 3 steers. "Molasses."	Half Lot 3. 3 steers. "No Molasses."
Total live weight of 3 steers November 17, 1913.....lb.	3,275	3,610
Total live weight of 3 steers March 30, 1914.....lb.	4,155	4,610
Increase to March 30, 1914.....lb.	880	1,000
Molasses—		
Original weight of 3 steers, 3,275 pounds, at 7·23 cents.....$	236.78	.....
Weight at finish of 3 steers, 4,155 pounds, at 9 cents.....$	373.95	.....
No Molasses—		
Original weight of 3 steers, 3,610 pounds, at 7·23 cents.....$	.....	261.00
Weight at finish of 3 steers, 4,610 pounds, at 9 cents.....$	.....	414.90
Gross profit.....$	137.17	153.90
Amount of hay consumed.....lb.	5,985	5,985
Amount of meal consumed.....lb.	2,646	2,646
Amount of roots consumed.....lb.	22,995	22,995
Amount of molasses consumed.....gal.	55	.....
Cost of feed for lot for 133 days.....$	92.32	81.32
Net profit.....$	44.85	72.58
Daily rate of gain per steer.....lb.	2·205	2·506
Cost of 1 pound gain.....cts.	10·49	8·13
Cost of feed per day per steer.....cts.	23·13	20·38
Profit per steer.....$	14·95	24·19

NAPPAN.

Steers fed at Nappan, N.S., 1913-14.

Steers fed at Kentville, N.S., 1913-14.

STEER FEEDING EXPERIMENT at Nappan from November 17, 1913, to March 30, 1914. Comparison of sub-lots of Lot 4, Good Stockers, Light Fed. Molasses *vs.* No Molasses.

		Half Lot 4. 3 steers. "Molasses."	Half Lot 4. 2 steers. "No Molasses."
Total live weight of steers November 17, 1913	lb.	3,815	1,975
Total live weight of steers March 30, 1914	lb.	4,650	2,555
Increase to March 30, 1914	lb.	835	580
Molasses—			
Original weight of 3 steers, 3,815 pounds, at 7·23 cents	$.	275 82	.....
Weight at finish of 3 steers, 4,650 pounds, at 9 cents	$.	418 50	.....
No Molasses—			
Original weight of 2 steers, 1,975 pounds, at 7·23 cents	$.	.....	142.79
Weight at finish of 2 steers, 2,555 pounds, at 9 cents	$.	.....	229.95
Gross profit	$.	142.68	87.16
Amount of hay consumed	lb.	5,985	3,990
Amount of meal consumed	lb.	2,646	1,176
Amount of roots consumed	lb.	22,995	10,220
Amount of molasses consumed	gal.	55	.....
Cost of feed for lot for 133 days	$.	92·32	41·46
Net profit	$.	50·36	45·70
Daily rate of gain per steer	lb.	2·092	2·180
Cost of 1 pound gain	cts.	11·05	7·14
Cost of feed per day per steer	cts.	23·13	15·58
Profit per steer	$.	16·78	22·85

METHOD OF WORK.

WEIGHING.

The steers were weighed three consecutive mornings, starting November 15, 1913, then weighed into experiment on November 17, and weighed at one-week intervals (Monday mornings) until the end of the feeding period. The steers were weighed at a reasonable time after morning's meal and before they were watered. Individual weights were kept.

FEEDING.

1. Feeding period was from November 17, 1913, to March 30, 1914.

2. From November 3 to 17 was the preparatory period, in which they were given roots, hay, and meal, gradually working them up to a normal feed at the beginning of the experiment.

3. See table for period of feeding.

4. All hay fed was best quality, and the amount fed to each lot was weighed weekly.

5. Roots consisted mostly of turnips, and were weighed daily on barn scales.

6. Meal ration consisted of the following mixture:—

Mixed crushed grain: bran, 200 pounds; oats, 200 pounds; barley, 200 pounds; cotton seed, 100 pounds.
Molasses as per diagram.

The prices of feed were: Meal ration, $1.30 per cwt.; roots, $2 per ton; hay, $8 per ton; and molasses, 20 cents per gallon.

See table as to amounts for respective periods of four weeks each, except the last period which was to have extended to April 6, but owing to the fact that a most satisfactory sale was made for the Easter market, and part of the steers were shipped on the 2nd of April, it was found necessary to close the experiment on March 30. Consequently, there are only three weeks in the last period.

Rations for Steers.

Lot.	Row.	No. of Steers.	Ration per steer per day.													
			Nov. 17 to Dec. 14, 1913			Dec. 14 to Jan. 11, 1914			Jan. 11 to Feb. 8, 1914			Feb. 8 to Mar. 8, 1914			Mar. 8 to Mar. 30, 1914		
			Roots.	Meal.	Molasses.	Roots.	Meal.	Molasses.	Roots.	Meal.	Molasses.	Roots.	Meal.	Molasses.	Roots.	Meal.	Molasses.
			Lb.	Lb.	3 steers. Lb.	Lb.	Lb.	3 steers. Lb.	Lb.	Lb.	3 steers. Lb.	Lb.	Lb.	3 steers. Lb.	Lb.	Lb.	3 steers. Lb.
1	2	6	40	2–3	1	40	3–4	2	40	4–6	2	40	6–8	2	30	8	2
2	3	6	60	3–4½	1	60	4½–6	2	60	6–9	2	60	9–12	2	45	12	2
3	1	6	60	3–4½	1	60	4½–6	2	60	6–9	2	60	9–12	2	45	12	2
4	1	6	40	2–3	1	40	3–4	2	40	4–6	2	40	6–8	2	30	8	2
5	4	4	40	1–2	1	40	2–3	2	40	3–4	2	40	4–6	2	30	6	2

P.S.—15 pounds of hay per steer per day.

OBJECT OF THE EXPERIMENT.

1. To show the results in feeding 50 per cent more roots and meal to heavy weight steers.
2. To show the results in feeding 50 per cent more roots and meal to medium weight steers.
3. To show the difference in profit in feeding the medium and heavy weight steers.
4. To show the value of molasses in finishing beef.
5. To show that molasses can or cannot profitably replace part of meal ration.

DEDUCTIONS.

While these results do not coincide with those of the 1912-13 test, which was carried on along similar lines, it goes to show that it is quite impossible to draw a definite conclusion from one or even two years' results, due to such influences as the difference in individuality of the animals, and the selling price. These steers, though not all in the same flesh, sold for the same price, whereas had they been divided according to class, the selling price of the different grades might have been somewhat different, which, naturally, would have made some difference in profit from the different grades. However, there are some interesting points to be noted:—

1. While the daily rate of gain is greater in heavy-fed than in light-fed lots, yet the average cost per pound gain of the former is considerably higher, and the greatest profit was realized from the light-fed lots. One might expect this in the good butcher, but not in the good stocker.
2. Meal can be profitably replaced by molasses when used in only a limited amount.
3. When feeding the same amount of meal the addition of molasses at the price paid for it decreases the profit.
4. The molasses appears to have a more beneficial effect when fed to good stockers than to good butchers, when getting the same amount of meal.
5. In table three, lot 5 is figured at the actual buying and selling prices (See column 1). In column 2 the calculations are made on the same basis as lot 1. Even then, molasses shows a profit over the full-meal ration.
6. If, then, good feed molasses could be purchased for about $22 to $25 per ton instead of $33 it would add greatly to the value of a feeding ration.
7. Note in lot 4, steer No. 1 in row 1 had a set-back with a sore jaw and did not make very good gain. In lot 2, steer No. 5 was a very nervous animal, hence did not make as good daily gains as he otherwise would. In lot 4, steer No. 4 took ill with urinary trouble, and died. These unavoidable facts will account for some slight difference in the tables.

EXPERIMENTAL STATION, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT, W. S. BLAIR.

BEEF CATTLE.

Eighteen steers were purchased about the middle of November for feeding tests. They weighed 18,905 pounds and cost 5¾ cents per pound, live weight. Sixteen were separated into uniform lots of four each. Of these, eight were dehorned and placed loose, four each in two box stalls 12 by 12 feet in size. Eight were tied in stanchions. The different lots were fed exactly alike. The steers were all grade Shorthorns except the No. 5 lot which were grade Holsteins. The test covered a period of twenty weeks, commencing November 15 and ending March 29. The gain from these and the extra pair which were tied in stanchions is as follows:—

	Weight at start.	Weight at finish.	Total gain.
	lb.	lb.	lb.
No. 1 Loose	4,240	5,275	1,035
" 2 "	3,895	5,080	1,185
" 3 Tied	4,560	5,280	720
" 4 "	4,105	4,765	660
" 5 "	2,105	2,510	405
	18,905	22,910	4,005

The steers were fed 60 pounds roots, 12 pounds hay, and 5½ pounds meal mixture per day on the average. The meal during the first two weeks was 1 pound per day and was increased 1 pound every two weeks until the end of the twenty weeks, when they were getting 10 pounds each per day. The roots fed during the first period were 80 pounds per day which was lessened to 40 pounds at the close of the period, as the meal mixture was increased.

The meal mixture was made up of and cost as follows:—

400 pounds	bran at $1.05 per cwt.	$4 20
100 "	cottonseed meal at $1.95 per cwt.	1 95
100 "	linseed meal at $2 per cwt.	2 00
200 "	cornmeal at $1.85 per cwt.	3 70
100 "	crushed oats at $1.65	1 65
900 "	cost	$13 50

Or 1½ cents per pound, $30 per ton.

The roots were valued at $2 per ton.
Hay used cost $10 per ton.

The cost of feed per steer for period of 20 weeks was as follows:—

Roots, 8,400 pounds at $2 per ton	$ 8 40
Hay, 1,680 pounds at $10 per ton	8 40
Meal, 770 pounds at 1½ cents per pound	11 55
Total	$28 35

Cost per day for steer, 20¼ cents.

Lot 1—Loose.

Number of steers in lot		4
First weight, gross, November 15, 1913	lb.	4,240
First weight, average	"	1,060
Finished weight, gross March 30, 1914	"	5,275
Finished weight, average	"	1,318
Number of days in test	days	140
Total gain in 140 days	lb.	1,035
Average gain per steer	"	258
Daily gain per steer	"	1.84
Daily gain per lot	"	7.37
Gross cost of feed for period	$	113 40
Cost of 1 pound gain per lot	cts.	10.95
Cost, original, November 15, 1913, at $5.75 per cwt	$	243 80
Total cost March 30, 1914	"	357 20
Selling price, March 30, 1914, at $7.25 per cwt	"	382 43
Profit per lot	"	25 23
Profit per steer	"	6 30
Average valuation per steer to start, November 15, 1913	"	60 95
Average sale price per steer at finish, March 30, 1914	"	95 60
Average increase in value	"	34 65
Average cost of feed per steer	"	28 35
Amount of meal eaten	lb.	770
Amount of roots eaten	"	8,400
Amount of hay eaten	"	1,680

Lot 2—Loose.

Number of steers in lot		4
First weight gross, November 15, 1913	lb.	3,895
First weight, average	"	974
Finished weight, gross, March 30, 1914	"	5,080
Finished weight, average	"	1,270
Number of days in test	days	140
Total gain in 140 days	lb.	1,185
Average gain per steer	"	296
Daily gain per steer	"	2.11
Daily gain per lot	"	8.44
Gross cost of feed for period	$	113 40
Cost of 1 pound gain per lot	cts.	9.57
Cost, original, November 15, 1913, at $5.75 per cwt	$	223 96
Total cost March 30, 1914	"	337 36
Selling price, March 30, 1914 at $7.25 per cwt	"	368 30
Profit per lot	"	30 94
Profit per steer	"	7 72
Average valuation per steer to start November 15, 1913	"	55 9
Average sale price per steer at finish, March 30, 1914	"	92 07
Average increase in value	"	36 08
Average cost of feed per steer	"	28 35
Amount of meal eaten	lb.	770
Amount of roots eaten	"	8,400
Amount of hay eaten	"	1,680

Lot 3.—Tied.

Number of steers in lot		4
First weight, gross, November 15, 1913	lb.	4,560
First weight, average	"	1,140
Finished weight, gross, March 30, 1914	"	5,280
Finished weight, average	"	1,320
Number of days in test	days	140
Total gain in 140 days	lb.	720
Average gain per steer	"	180
Daily gain per steer	"	1.28
Daily gain per lot	"	5.12
Gross cost of feed for period	$	113 40
Cost of 1 pound gain per lot	cts.	15.75
Cost, original, November 15, 1913, at $5.75 per cwt	$	262 20
Total cost, March 30, 1914	"	375 60
Selling price, March 30, 1914, at $7.25 per cwt	"	382 80
Profit per lot	"	7 20
Profit per steer	"	1 80
Average valuation per steer to start, November 15, 1913	"	65\55
Average sale price per steer at finish, March 30, 1914	"	95 70
Average increase in value	"	30 15
Average cost of feed per steer	"	28 35
Amount of meal eaten	lb.	770
Amount of roots eaten	"	8,400
Amount of hay eaten	"	1,680

KENTVILLE.

Lot 4.—Tied.

Number of steers in lot		4
First weight, gross, November 15, 1913	lb.	4,105
First weight, average	"	1,026
Finished weight, gross, March 30, 1914	"	4,765
Finished weigh', average	"	1,191
Number of days in test	days	140
Total gain in 140 days	lb.	660
Average gain per steer	"	165
Daily gain per steer	"	1·18
Daily gain per lot	"	4·72
Gross cost of feed for period	$	113 40
Cost of 1 pound gain per lot	cts	17·18
Cost, original, November 15, 1913, at $5.75 per cwt	$	236 03
Total cost March 30, 1914	"	349 43
Selling price, March 30, 1914, at $7.25 per cwt	"	345 46
Loss per lot	"	3 97
Loss per steer	"	99
Average valuation per steer to start, November 15, 1913	"	59 00
Average sale price per steer at finish, March 30, 1914	"	86 36
Average increase in value	"	27 36
Average cost of feed per steer	"	28 35
Amount of roots eaten	"	8,400
Amount of meal eaten	lb.	770
Amount of hay eaten	"	1,680

Lot 5.—Tied.

Number of steers in lot		2
First weight, gross, November 15, 1913	lb.	2,105
First weight, average	"	1,052
Finished weight, gross, March 30, 1914	"	2,510
Finished weight, average	"	1,255
Number of days in test	days	140
Total gain in 140 days	lb.	405
Average gain per steer	"	202
Daily gain per steer	"	1·44
Daily gain per lot	"	2·88
Gross cost of feed for period	$	56 70
Cost of 1 pound gain per lot	cts.	·14
Cost, original, November 15, 1913, at $5.75 per cwt	$	121 03
Total cost, March 30, 1914	"	177 73
Selling price March 30, 1914, at $7.25 per cwt	"	181 97
Profit per lot	"	4 24
Profit per steer	"	2 12
Average valuation per steer to start, November 15, 1913	"	60 51
Average sale price per steer at finish, March 30, 1914	"	90 98
Average increase in value	"	30 47
Average cost of feed per steer	"	28 35
Amount of meal eaten	lb.	770
Amount of roots eaten	"	8,400
Amount of hay eaten	"	1,680

It will be seen that the eight steers in lots 1 and 2, given freedom in the box stalls, made a gain of $56.17 as compared with the eight in stanchions, lots 3 and 4 tied, which made a gain of $3.23. It may be pointed out that lots 3, 4 and 5 were not given exercise except that afforded by the swinging stanchion, and received their water in drinking bowls alongside the stall. When the steers were selected into lots an effort was made to place in lots 3 and 4 steers equally as good as those in lots 1 and 2.

The steers were sold to Linton and McLeod, Halifax, N.S., at $7.25 per hundred, fasted 12 hours.

KENTVILLE.

EXPERIMENTAL STATION, FREDERICTON, N.B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

BEEF CATTLE.

On account of the unfinished condition of the barns, the feeding of cattle could not begin until the 8th of January. At that time it was very difficult to get cattle, and the price was considerably higher than later in the season. Thirty-four head, mostly three and four-year-old steers, and many of them very poor type, were bought and stabled on the date mentioned. On the 14th of March, five more cattle were put in. They all cost 5½ cents a pound. The thirty-nine head weighed, unshrunken, 36,364 pounds.

On March 31 these cattle weighed 37,123 pounds, which, at 6½ cents per pound, would be worth $2,413.

As these cattle were very rough and had to be cleaned up and conditioned, no grain was fed except bran, heavier feeding being reserved for the latter part of the fattening period.

Until the 1st of April these cattle consumed:—

Hay, 28 tons at $8	$ 224 00
Turnips, 2,000 bushels at 8 cents	160 00
Bran, 4,500 pounds at $18 per ton	40 50
	$ 424 50

The account would stand as follows:—

Cost of feed		$ 424 50
Cost of cattle		2,000 00
Value at 6½ cents per pound, stable weight.	$2,413 00	
Loss on first feeding period	11 50	
	$2,424 50	$2,424 50

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

STEER FEEDING EXPERIMENTS.

During the winter of 1912-13, twenty steers were fed for experimental purposes. They were all fed out-of-doors and the season was quite unfavourable for the out-door feeding. There was a large amount of stormy weather, with strong winds and snow. This is much harder to bear than severe cold. The gains made were small, and the profits not as large as should have been obtained considering the margin between buying and selling prices.

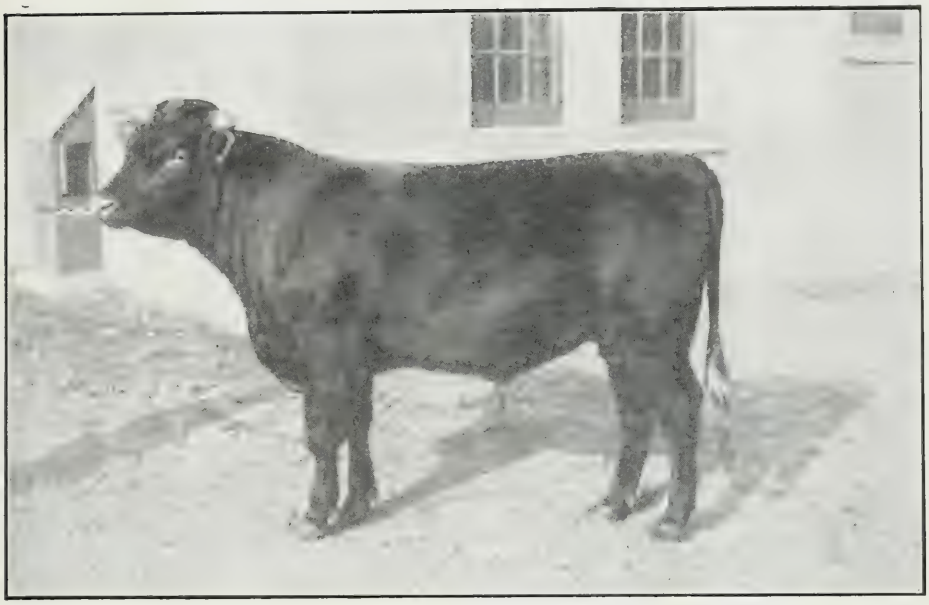
The experiment conducted was a comparison of alfalfa against part of the grain ration. The alfalfa steers were hardly as good a lot as the others, and were in a more exposed location, so that the results are not a fair indication of the comparative feeding value of alfalfa.

Both lots were given all the straw they would eat. Both lots were started on 2 pounds of grain per day; this was gradually increased from week to week. From January 1, lot 1 received 3 pounds less grain each per day than lot 2, and in its place received 3 pounds of alfalfa. The grain ration at the end of the test was 15 pounds per steer daily for lot 2. After April 15, lot 2 received some alfalfa in addition to straw, and both lots received a small allowance of roots daily.

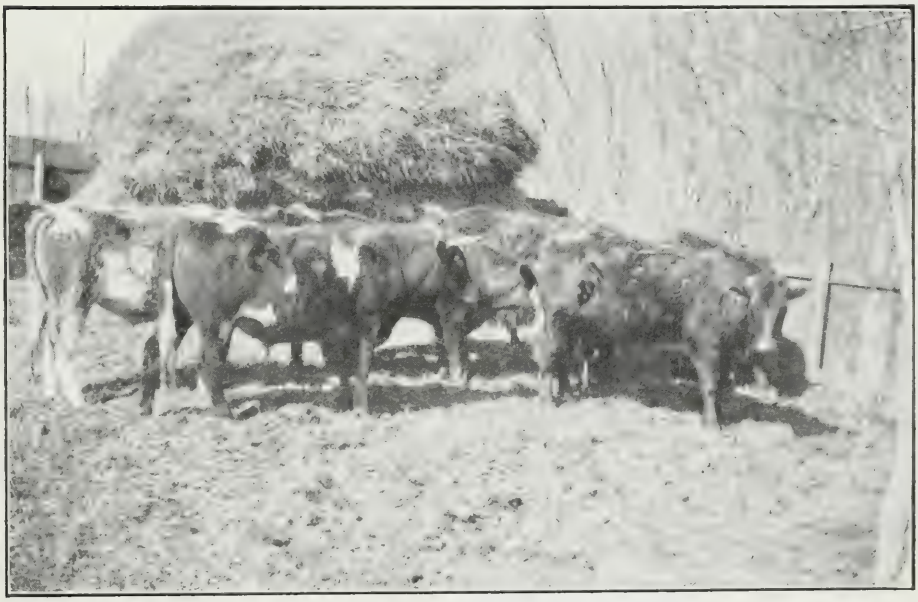
The details of the experiment and the results obtained are stated in tabular form herewith:—

STEER FEEDING Experiment, 1912-13.

	Lot 1.	Lot. 2.
Number in lot	8	12
First weight gross, November 18, 1912 ..lb.	8,750	13,735
First weight average ..“	1,094	1,145
Finished weight gross, June 6, 1913 ..“	9,855	15,655
Finished weight average ..“	1,232	1,305
Total gain in 200 days ..“	1,105	1,880
Average gain per steer ..“	138	157
Average daily gain per steer ..“	.69	.78
First cost of steers at $5.80 per cwt ..“	507 50	796 63
Total cost of feed ..“	199 27	300 32
Total cost ..“	706 77	1,096 95
Receipts from sale at $7.75 per cwt., 5 per cent shrinkage ..“	725 63	1,152 58
Profit ..“	18 86	55 63
Average cost per steer ..“	63 44	66 39
Average cost of feed per steer ..“	24 91	25 03
Average selling price per steer ..“	90 70	96 05
Average profit per steer ..“	2 35	4 63
Average cost of 1 pound gain ..cts.	18	16
Returns realized per 100 pounds of oats and barley ..“	95	99
Amount of feed used		
Oat and barley chop, $15 per ton ..lb.	13,656	23,202
Ground corn, $20 per ton ..“	718	1,092
Alfalfa, $10 per ton ..“	7,488	7,452
Roots, $3 per ton ..“	2,821	4,074
Straw, $2 per ton ..“	48,000	72,000



King Edward by Butterfly King. Dual purpose Shorthorn at the head of the Experimental Farm Herd at Indian Head, Sask.



Steers fed outside in a corral at Indian Head, Sask.

CORN SILAGE *vs.* DRY CORN FODDER.

For the season of 1913-14 a very interesting experiment is under way in which corn silage is being tested against dry corn fodder cured in stocks, as a feed for fattening steers. A carload of rather good steers was purchased at 6 cents per pound in Winnipeg in November, 1913. Freight, commission, and shrinkage in weight brought their cost up to $6.40 per cwt., when landed in Brandon. They were divided into two lots, and great care was taken to have them divided as equally as possible. Both lots are being fed in large box stalls of the stable. They were dehorned when put in; one steer in lot 2 bled badly, but recovered afterwards. Both lots received the same quantity of meal and the same quantity of straw and, later in the test, the same quantity of alfalfa. The corn silage and fodder were analysed to find the percentage of moisture in each, and were fed in such quantities as to give each lot the same amount of dry matter. The corn fodder was cut up and mixed with straw the same as is done with ensilage, so that both should be fed under identical conditions.

The experiment is not finished at the end of the fiscal year, and consequently it is impossible to report the results, but the weights of each steer during each month of the test up to the present are available and as they are rather interesting and instructive, are given herewith:—

Lot I.—Fed Dry Corn Fodder.

No. of Steer.	Weight at start.	Weight after 1 month.	Weight after 2 months.	Weight after 3 months.	Weight after 4 months.	Weight after 5 months.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
1	1,015	1,060	1,095	1,125	1,155	1,190
2	935	1,000	1,030	1,085	1,180	1,195
3	1,025	1,055	1,080	1,160	1,180	1,260
4	1,040	1,120	1,130	1,165	1,215	1,260
5	1,105	1,180	1,270	1,290	1,355	1,425
6	1,030	1,065	1,085	1,145	1,220	1,250
7	1,015	1,015	1,090	1,130	1,165	1,220
8	940	1,005	1,050	1,090	1,120	1,185
9	1,110	1,150	1,200	1,250	1,290	1,330
10	1,050	1,105	1,110	1,145	1,215	1,245
Total	10,265	10,755	11,140	11,585	12,095	12,560
Average per steer	1,026½	1,075½	1,114	1,158½	1,209½	1,256
Average gain in month	.....	49	38½	44½	51	46½

Total gain for 5 months, 2,295 pounds.
Average gain per steer for 5 months, 229½ pounds.
Average gain per steer per day, 1·5 pounds.

BRANDON.

Lot 2.—Fed Corn Silage.

No. of Steer.	Weight at start.	Weight after 1 month.	Weight after 2 months.	Weight after 3 months.	Weight after 4 months.	Weight after 5 months.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
1	1,010	1,080	1,100	1,195	1,230	1,270
2	1,000	1,080	1,110	1,225	1,282	1,340
3	1,225	1,280	1,310	1,410	1,405	1,480
4	965	1,015	1,080	1,185	1,200	1,270
5	1,055	1,175	1,230	1,320	1,380	1,460
6	975	1,030	1,090	1,155	1,200	1,215
7	1,000	1,050	1,100	1,185	1,210	1,260
8	1,025	1,080	1,125	1,200	1,230	1,280
*9	920	905	1,000	1,095	1,125	1,190
10	*1,065	1,120	1,135	1,230	1,275	1,320
Total	10,240	10,815	11,280	12,200	12,535	13,085
Average per steer	1,024	1,081½	1,128	1,220	1,253½	1,308½
Average gain in month	.....	57½	46½	92	33½	55

*Bled badly when dehorned.

Total gain for 5 months, 2,845 pounds.
Average gain per steer for 5 months, 284½ pounds.
Average gain per steer per day, 1·86 pound.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT, T. J. HARRISON, B.S.A.

BEEF CATTLE.

The herd of Shorthorns was formerly handled entirely as a beef herd, but in future the main work with cattle is the development of the dual-purpose Shorthorn, while any individuals that are of decided beef type and conformation will be dealt with as such.

The cost of raising calves by hand will be compared with the cost of raising beef calves by running with the cow. At present one cow is raising two calves and doing justice to them. She really should be treated as a dual-purpose cow, but is of such an ugly disposition as to forbid milking by hand. Sometimes she objects even to her own calf sucking her, let alone her foster calf, but as far as type is concerned she is a very promising cow and so there are hopes of raising one or two dual-purpose heifers from her.

During last season there were sold from the Farm for breeding purposes, five young bulls and one aged bull.

STEER FEEDING EXPERIMENTS.

Supplementary to the work with the beef herd, steer-feeding experiments were conducted during the past winter. Fourteen two-year-old steers and fourteen three-year-olds were bought November, 1913. The former were apparently raised on farms, while the latter were "range" steers and gave, as one would naturally expect, trouble accordingly. Our experience with them would not warrant our attempting again to fatten "range" steers, especially of that age. Stabling them even "loose" is too much of a contrast to their former existence to give good results, while tying them up in stanchions is nothing but imprisonment. The care and handling was such as to leave the suggestion that if steers of a like kind be bought again, they should be fed loose outside. According to results in the following tables, where, among other comparisons, that of feeding outside and inside was reckoned, it was found that those fed outside gave more satisfactory returns than those fed similarly inside. Those fed outside brought $7.35 per cwt., while those fed the same ration inside brought only $7.25 per cwt. As far as weights were concerned there was nothing to choose between these two groups, but the appearance of those fed outside was much in their favour compared with the inside lot similarly fed.

The steers were divided into four groups, and each group again subdivided into two lots. This experiment comprised a comparison of two-year-olds and three-year-olds, steers of similar ages fed inside compared with those fed outside and getting the same feed, and also a comparison between different feeds.

STEER-FEEDING Experiments.

Group	Ration.	Method of feeding.	Lot 1. Three-year olds.	Lot 2. Two-year-olds.
			No.	No.
1	Oat straw, mixed hay, meal (oats and barley)	Fed outside	4	4
2	Same as above	Fed inside (tied)	4	4
3	Same as above with an addition of ensilage (to test value of ensilage)	" "	4	4
4	Mixed hay, ensilage, roots, meal (bran, peas, oats and barley)	" "	2	2

MIXTURE.

The meal mixture in the first three groups was made up of equal parts of barley and oats, while in group 4 the proportion was two of oats, two of barley, one of peas, and one of bran. The main purpose of using ration number four was to make a comparison between a good standard ration of this kind and other rations which, while open to criticism, could well be used by the average farmer in the district. The prices charged for feed are as follows:—

Ground oats	$24 00	a ton.	
" barley	24 00	"	
" peas	28 00	"	
Bran	20 00	"	
Mixed hay	10 00	"	
Alfalfa	$10 00	a ton.	
Oat straw	2 00	"	
Ensilage	2 50	"	
Roots	2 50	"	

Results of Steer-feeding Experiments.

	Group 1.		Group 2.		Group 3.		Group 4.	
	Lot 1.	Lot 2.	Lot 1.	Lot 2.	Lot 1.	Lot 2.	Lot 1.	Lot 2.
Number of steers in experiment	4	4	4	4	4	4	2	2
Number of days in experiment	140	140	140	140	140	140	140	140
Total weight at beginning of experiment lb.	4,680	3,885	4,337	3,050	4,770	3,505	2,200	1,825
" " end " "	5,655	5,104	5,268	4,295	6,138	4,925	2,950	2,688
Gain during period "	975	1,219	931	1,245	1,368	1,420	750	863
Gain per head "	243·75	304·75	232·75	311·25	342	355	375	431·5
Daily gain per head "	1·75	2·15	1·65	2·22	2·44	2·5	2·65	3
Amount of meal eaten by lot "	5,600	5,600	5,880	4,760	5,040	3,644	2,520	1,960
" mixed hay " "	4,760	4,760	5,040	4,760	3,920	3,360	2,940	2,100
" oat straw " "	2,800	2,800	2,800	2,800	2,240	1,960	.....	.....
" ensilage " "	.....	.....	.....	.....	32,480	29,680	4,200	3,780
" roots " "	.....	.....	.....	.....	.....	.....	4,200	3,780
Total cost of feed	$ 93.80	$ 93.80	$ 98.50	$ 83.72	$ 97.63	$ 80.99	$ 57.95	$ 45.48
Cost of feed per head	23.45	23.45	24.62	20.93	24.40	20.25	28.95	22.74
" " per day	.16	.16	.17	.14	.17	.14	.20	.16
Cost to produce one pound gain	.09	.07	.10	.07	.07	.06	.07	.52
Original cost of steers	292.50	233.10	271.06	183 00	298.10	210.30	137.50	109.50
" " " and feed	386.30	326.90	369.56	266.72	395.73	291.29	195.45	154.98
Total receipts from sale	415 65	375.15	381.93	311 38	461.35	369.37	221.25	187.60
Net profit on lot	29 35	48.25	12.37	44.66	65.62	78.08	25 80	32.62
Net profit on steer	7.35	12.06	3.09	11.16	16.40	19.52	12.95	16.31

The foregoing steers were bought at an average price of 6⅛ cents per pound, 6¼ cents for the three-year-olds and 6 cents for the two-year-olds. The highest selling price was 7½ cents per pound given for groups 3 and 4, with $7.35 per cwt. for the outside lot, and $7.25 for those inside fed similarly to those outside.

A study of the results of this experiment will show that, though only a fair profit was made, yet considerable information was gained. At the outset it was the intention to carry on a "short" feeding-period, but when this period was expired (three months) markets were low. At that time the steers showed a very satisfactory profit, while the ultimate results were not so good. The reason is obvious. The steers were kept two months awaiting a reasonably high market, but during the last month they held their own only. This experience proves the point that unless markets are favourable, the feeder has difficulty to make money in this business. Our results show that the steers, generally speaking, fed fairly well but the margin between the buying and selling price was too narrow.

Another fact well worthy of notice is that the steers fed the choicest rations brought the highest price.

EXPERIMENTAL STATION, SCOTT, SASK.

REPORT OF THE SUPERINTENDENT, R. E. EVEREST, B.S.A.

BEEF CATTLE.

Work was undertaken this year in the line of outside winter feeding of steers for beef production. For this purpose seventeen steers were purchased in October and placed on prairie pasture, where they remained until the 1st of December. On this date they were weighed into corral and started on a light meal ration and prairie hay. Water, salt and a bed of straw were provided at all times for the cattle. The corral was enclosed by woven wire fencing and on its east side had protection for 70 feet by an implement shed. On the northwest corner, a shelter of a straw shed with an open front was constructed. The cattle on the feeding test by our own weights made a fair showing. The figures which are taken for use in the following table, however, are the actual purchasing and selling weights. Both of these were taken at points when a railway journey had intervened. A further circumstance which affected unfavourably the results was the conditional offer which was accepted in the disposal of the stock. The fulfilment of this offer resulted in a severe grading of cattle with resultant low prices, and the shrinkage in weight was large. In fairness to the cattle and this line of work it may be said that even on the little change in price which existed in the general market from buying as feeders in October, 1913, to selling as beef in April, 1914, the steers, on a previous sale, would have shown a small profit.

Outside Winter Feeding of Steers for Beef Production.

Number of animals fed		17
Purchasing weight, October 11, 1913	lb.	17,905.00
Purchasing weight, average	"	1,053.24
Selling weight, gross, April 4, 1914	"	18,730.00
Selling weight, average	"	1,101.76
Number of days in pasture, 46; in corral, 122		168
Total gain for period	"	825.00
Average gain per animal	"	48.53
Average daily gain for group	"	4.91
Average daily gain per animal	"	0.29
Quantity of meal eaten by group	"	23,358.00
Quantity of hay eaten by group	"	48,070.00
Quantity of oat sheaves eaten by group	"	1,336 00
Total cost of feed	$	325.12
Cost of feed per head	$	19.12
Cost of feed per head per day	cts.	11 8/21
Cost to produce 1 pound gain	"	39 2/3
Original cost of animals	$	1,119.06
Original cost plus cost of feed	$	1,444.18
Selling price	$	1,285.67
Net loss per group	$	158 51
Net loss per animal	$	9.32
Findings from experiment—		
Nutritive ratio of total ration		1 to 7.61
Nutritive ratio of meal ration		1 to 7.95
Dry matter required to produce 1 pound gain	lb.	77.31
Digestible matter required to produce 1 pound gain	"	32.34
Meal required to produce 1 pound gain	"	28 35
Meal digestible dry matter required to produce 1 pound gain	"	22.06
Roughage required to produce 1 pound gain	"	59.89
Roughage digestible matter required to produce 1 pound gain	"	10.29

EXPERIMENTAL STATION, ROSTHERN, SASK.

REPORT OF THE SUPERINTENDENT, W. A. MUNRO, B.A., B.S.A.

STEER-FEEDING EXPERIMENT.

The first experiment in steer feeding was begun by the purchase of eleven steers on November 17, 1910. They were fed in the open and the only shelter afforded was an open shed. Until December 8, they had the run of a straw stack, which perhaps afforded a little better fare than pure straw because of some grain left where the machine threw. On December 8 they were started on a ration of meal which gradually increased until the finish.

The water was supplied *ad libitum*, and was kept from freezing by means of a tank heater.

Following is the rate of feeding and the rations used at different dates, followed by a table of the weights for the total herd at stated periods, and of two individual steers in the herd, together with a statement of the cost price, cost of feed, and gain or loss. The cost of feed is based upon the following values: Corn stover, $3 per ton (green weight); hay, $10 per ton; roots, $3 per ton; oat and barley meal, 1 cent per pound.

Steers, Experimental Station, Rosthern.

Lacombe. Group fed in Barn, 1913-14.

DAILY RATIONS for Steers during the following periods.

Feed.	Nov. 17	Dec. 8	Dec. 8 to 22	Dec. 22 to Jan. 5	Jan. 5 to Jan. 12	Jan. 12 to Jan. 26	Jan. 26 to Feb. 9	Feb. 9 to Feb. 23	Feb. 23 to Mar. 9	Mar. 9 to Mar. 23	Mar. 23 to Apr. 6	Apr. 6 to Apr. 20	Apr. 20 to Apr. 28	TOTAL FEED. Per Steer	TOTAL FEED. Per Herd.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Corn stover				37	37	37	37	37						2,331	25,641
Hay									15	15	15	10	10	850	9,350
Straw	*Ad libitum*														
Roots				14	20	25	35	35	35	40	40	30	30	3,906	42,966
Oat chop			2½	5	9	12	14							532	5,852
3 oat, 1 barley chop								13½	15	18	18	18	18	961 320	10,568 3,523

Weights of Steers at Intervals.

	Nov. 17	Dec. 8	Jan. 5	Feb. 23	Mar. 9	Mar. 23	Apr. 6	Apr. 20	Apr. 28	Gain	Cost at 5½c.	Cost of Feed.	Selling Price at 7c.	Gain.	Loss.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Eleven steers	11,048	11,644	11,704	12,979	13,482	13,890	14,048	14,316	14,665	3,617	607 64	349 08	1026 55	69 83	.
No. 1 beef type	1,175	1,246	1,218	1,354	1,410	1,442	1,470	1,522	1,558	383	64 62	31 73	109 06	12 71	.
No. 2 dairy type	979	1,028	1,030	1,104	1,150	1,184	1,160	1,220	1,190	211	53 84	31 73	.	.	2 27
Average	1,004	1,058	1,064	1,170	1,225	1,262	1,277	1,301	1,333	329	55 24	31 73	93 32	6 35	.

RESULTS OF EXPERIMENT

Number of steers in lot		11
First weight, gross, November 17, 1913	lb.	11,048
First weight, average	"	1,004
Finished weight, gross	"	14,665
Finished weight, average	"	1,333
Number of days under test		162
Total gain in 162 days	lb.	3,617
Average gain per steer	"	329
Daily gain per steer	"	2.03
Daily gain per lot	"	22.33
Gross cost of feed for period	$	349 08
Cost of 1 pound gain per lot	cts.	9.65
Cost, original, November 17, 1913, $5.50 per cwt	$	607 64
Selling price, April 28, 1914, at $7 per cwt	"	1,026 55
Profit per lot	"	69 83
Profit per steer	"	6 35
Average valuation per steer at start, November 17, 1913	"	55 24
Average sale price per steer at finish, April 28, 1914	"	93 33
Average increase in value	"	38 09
Average cost of feed per steer	"	31 73
Amount of meal eaten	lb.	19,943
Amount of roots eaten	"	42,966
Amount of hay eaten	"	9,350
Amount of straw eaten, *ad libitum*, no record taken.		
Amount of corn stover eaten (green weight)	"	25,641

DEDUCTIONS.

1. Corral steer feeding, even in spite of severe weather, may be profitable.

2. Good steers of beef type make rapid gains and fair profit under these conditions, with these food stuffs, and with $1.50 spread between buying and selling prices.

3. Grains and roughages may be marketed most profitably through the feeding of steers.

4. In this experiment, steers of good beef type made rapid and economical gains and good profits, and steers of dairy type made slower gains costing more to produce, and were fed at a loss.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

BEEF CATTLE.

The herd of pure-bred Aberdeen Angus cattle now number twenty-four, of which fifteen are females over 1 year old, and all but two of which are of breeding age. Two pure-bred Aberdeen Angus cattle aborted during the year, but the loss is believed not to have been due to contagious abortion, as after some months there has been no indication of the recurrence of the trouble.

A number of very fine calves have been reared during the year.

Four steer calves from Shorthorn sires have been hand-raised this season. The following table shows weights attained and cost of food to March 31, 1914:—

No.	Date of Birth	Weight at Birth	Weight March 31 1914.	Whole and Skim Milk.	Chop.	Hay and Green Feed.	Cost.	Cost per 100 lbs. Gain.
				lb.	lb.	lb.		
8	Dec. 25, 1912	90	860	2,940	1,340	1,700	$41·04	$4·77
9	Jan. 1, 1913	90	810	2,990	1,131	2,960	40·65	5·01
21	Feb. 7, 1913	86	715	2,800	1,057	2,760	33·97	4·75
22	Feb. 13, 1913	82	695	2,840	1,057	2,760	34·29	4·93

The dams of these four calves produced 24,881·6 pounds of milk during the lactation period following freshening at the birth of these calves, which, if sold at market price for butter production, would leave a fair profit. The cows were not kept simply for the production of the calves, but were of considerable value as dairy cows, and leave a profit after covering the cost of feed and depreciation.

Eight calves were raised on the cows and weighed less at the same age, though these were not so favourably housed. They ran out through the winter, being fed hay, green feed and chop. The feed cost per head figuring the charges up to 6 months old is as follows:—

Interest on an investment of $90	$7 20
Maintenance of dam during winter, 6 months	9 00
Maintenance of dam during summer, 6 months	6 00
Depreciation in value of dam	10 00
Roughage per head for calf for first four months of winter at $10	4 95
Chop per head for calf for first four months of winter at 1 cent per pound	4 95
Total cost per head to rear calves to approximately 1 year old	$42 10
Average weight per head	lb. 622
Cost per 100 pounds gain	$ 6 76

It should be remembered that the first summer's gains on pasture will doubtless reduce cost of production more rapidly on the group raised on the cows and wintered outside than on those raised by hand and wintered inside.

Fourteen grade cattle are being used in the experimental work in the beef cattle division of the live stock work at this Station.

FEEDING FOR BEEF.

Three groups of steers of similar quality were fed under different conditions during the winter of 1913-14. The cattle were divided at the beginning into three lots as nearly equal in point of breeding, age, and conformation as was possible. One group was fed in the barn in loose boxes, another in a corral without shelter except a straw stack and with a very limited run, and a third was fed in the brush with free run, having the brush and straw stack for shelter. The group fed in the barn had access to water at all times, the group fed in the corral was watered at a large tank which was kept open practically all the time by the use of a tank heater. The group in the brush was watered through the ice at a water hole in a small lake. A similar experiment last year gave results showing the cost of gain less for the group fed in the corral than those under other conditions. This year's results are somewhat contradictory, the group fed inside showing cheapest gains. It is certain that the group fed inside would show a heavier shipping shrinkage than either of those fed under outside conditions. The inside group this year had the advantage over those fed inside a year ago, in that water had been put into the barns this season and the inside steers were able to drink at will, while those inside, a year ago, were watered only twice daily.

The average cost of 1 pound of gain is less for the three groups than the cost of gain in any year since 1909-10. Since the price charged for feed is higher for this test than that of 1909-10, it is safe to say that the cost of gain this year as compared with the cost of feed is less than for any season since feeding trials began here. Green feed (peas and oats cut green and cured as hay) is charged against the cattle at $10 per ton and, since 119 tons were cut from 35 acres, it is evident that this crop is a paying one when sold at this rate. A mixture of oats, barley, and wheat made up of about two-fifths oats, two-fifths barley, and one-fifth wheat constituted the grain ration, which is charged at 1 cent per pound ground. A small charge is made to cover cost of bedding. The selling price was only slightly in advance of the purchase price and, considering this fact in conjunction with the fact that feed consumed by the cattle has been well sold, it is somewhat remarkable that even a small profit can be shown. These results are further evidence of the value of live stock as a medium for the most profitable marketing of grain and fodder. It is commonly believed to be a difficult matter to transform products, such as low grade grain and fodder crops, into profits at the present time, yet when fed to steers these crops bring high prices.

While the results this season indicate an advantage in favour of inside feeding, it is well to remember that those fed outside without shelter made good gains. The fact that a prospective feeder does not feel able to erect shelter should not deter him from undertaking cattle feeding. It should also be pointed out that a charge of $4 per head might be made against the cattle fed in the barn to cover interest on the investment, and that three groups of steers would be required to be fed in the barn in the course of a year to fully cover such interest charge. It is, therefore, doubtful as to whether it would be possible to pay interest on such shelter by feeding cattle, even with the same advantage secured in each test as in the trial, since it would scarcely be practical at the present time to buy and turn off three groups per annum. Another advantage enjoyed by the inside group this year consisted in the fact that they were protected from the cold weather, permitting good gains, even in the extreme cold. The cattle were sold before warm weather made more rapid gains possible in the outside groups.

All steers were dehorned in October, 1913, some time before the grain ration was commenced, but after danger from flies was past. The dehorning did not appear to interfere to any great extent with the gains made.

The following figures give the results in detail:—

		Brush	Corral.	Barn.	Total.
Number steers in lot		8	11	8	27
First weight November 16, 1913	lb.	9,480	13,484	9,056	32,020
First weight average	"	1,185	1,226	1,132	1,181
Finished weight, February 9, 1914	"	10,655	14,941	10,865	36,461
Finished weight average	"	1,332	1,358	1,359	1,350
Total gain in 85 days	"	1,175	1,457	1,809	4,441
Average gain per steer	"	147	132	227	169
Average daily gain per steer	"	1·73	1·55	2·67	1·99
Average daily gain per lot	"	13·84	17·05	21·36	52·25
Total cost of feed	$	111·22	152·71	111·16	370·09
Cost of 100 pounds gain	"	9·47	10·48	6·15	8·70
Selling price, $7·15 per cwt., less 5 per cent shrink	"	723·72	1,014·87	738·02	2,476·61
Profit on lot	"	10·78	24·55	31·42	9·97
Profit per steer	"	1·34	2·23	3·93	·37
Average value of steer at start	"	77·91	80·61	74·45	77·65
Average selling price per steer	"	90·46	92·25	92·00	91·57
Amount of meal eaten	lb.	5,902	8,129	5,902	19,933
Amount of green feed eaten	"	9,100	12,530	9,100	30,730
Amount of straw eaten	"	11,856	16,302	11,842	40,000
Amount of salt eaten	"	54	54	50	158
Average increase in value	$	12·55	11·64	17·57	13·92
Average cost of feed per steer	"	13·90	13·88	13·89	13·89

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S.

STEER-FEEDING EXPERIMENT.

With the yearly increase in acreage of alfalfa on the irrigated lands in the district, more and more interest is being taken by farmers in the question of feeding it at home rather than baling and shipping. To gather data along this line a feeding test was carried out with a carload of steers.

Steers were purchased from Mr. A. C. Christensen, Beazer, Alta. The price paid was $75 per head for 3-year-olds and $65 per head for 2-year-olds; the average price per hundred pounds was $6.17. They were shipped from Cardston by rail and were received at the Station on September 21. From then on to November 2 they were allowed to run on stubble, with access to a small field of rape.

One of the objects aimed at was to test the feeding of alfalfa combined with oat hay as a roughage, compared with feeding alfalfa alone.

The cattle were divided into three groups and fed as follows:—

Group I.—Alfalfa, roots and meal.

Group II.—Alfalfa, oat sheaves, roots and meal.

Group III.—Alfalfa, oat sheaves, roots and meal.

The first two groups were as nearly equal in point of size and conformation as possible, whereas group III contained some of the culls and the four two-year-old steers. All three groups were fed in the open in corrals adjacent to the barn and had open straw sheds for shelter. They were watered once a day by being driven to the Farm reservoir which was about a quarter of a mile from the feeding yards.

FEEDS.

In every case the steers were given all the alfalfa they would eat up clean. Four pounds per day of green oat sheaves were given to groups II and III for the greater part of the feeding period; during the balance of the time they received 5 pounds. The roots consisted of pulped turnips; the meal of equal parts of wheat, oats, and barley. The prices charged for the feed were as follows:—

	Per Ton.
Alfa'fa hay	$12 00
Green oat sheaves	10 00
Meal	20 00
Roots	3 00

		Group 1	Group 2	Group 3
Number of steers in group		6	6	7
First weight, gross, November 2, 1913	lb.	7,770	7,980	7,300
First weight, average	"	1,295	1,330	1,043
Finishing weight, March 16, 1914, gross	"	9,050	9,175	8,795
Finishing weight, average	"	1,508	1,529	1,256
Total gain for period, 135 days	"	1,280	1,195	1,495
Average gain per steer	"	213	199	214
Average daily gain per steer	"	1·6	1·5	1·6
Amount of meal eaten by group	"	6,335	5,553	7,062
Amount of alfalfa hay eaten by group	"	16,441	11,344	11,373
Amount of oat hay eaten by group	"	--	3,499	4,124
Amount of roots eaten by group	"	16,836	16,672	19,769
Amount of salt eaten by group	"	39	35	33
Total cost of feed	$	187·69	166·45	189·46
Cost of feed per steer	"	31·28	27·74	27·06
Cost of feed per steer per day	"	·23	·21	·20
Cost to produce 1 pound gain	"	·15	·14	·13
Original cost of group including freight, etc	"	462·00	462·00	499·00
Interest on investment at 8 per cent	"	18·48	18·48	19·96
Original cost plus cost of feed	"	668·17	646·93	708·42
Selling price, at $8·10 per hundred	"	733·05	743·17	712·39
Net profit per group	"	64·88	96·24	3·97
Net profit per steer	"	10·81	16·04	·57

THE SALE.

The steers were sold locally to Delaney's, Limited, on March 16.

FINANCIAL STATEMENT.

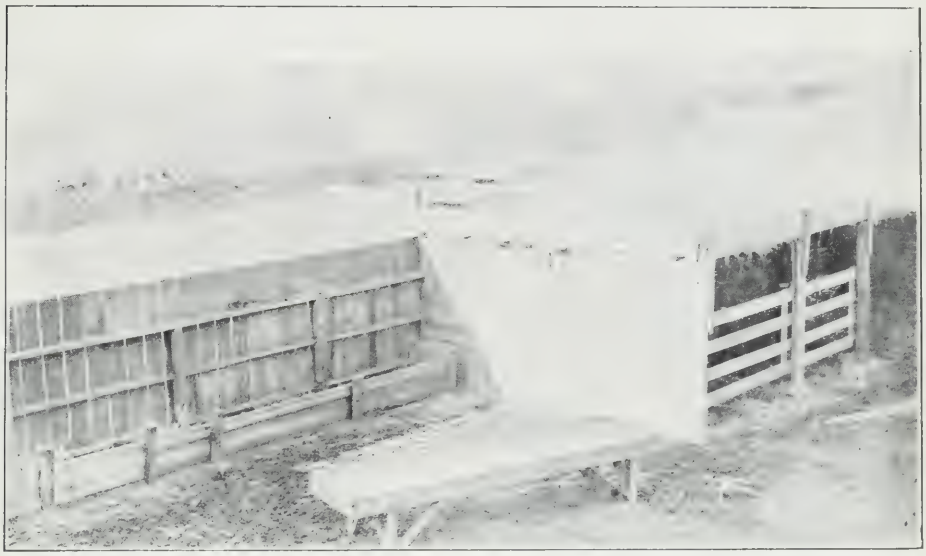
The day after the experiment started, a rather unusual accident happened. One steer died, presumably from the result of bloat. This is unusual, because cattle very rarely bloat on cured alfalfa hay. This one died in group 1, which had seven steers to start with, but the results are computed on six steers. In the financial statement, however, the price of the steer that died is included.

Cost of sixteen 3-year-old steers		$1,200 00
Cost of four 2-year-old steers		260 00
Freight charges		23 00
Interest on investment at 8 per cent		56 92
Pasture, 1½ months at $1 per head		30 00
Cost of feed		543 60
Selling price	$2,188 61	
Net profit		75 09
	$2,188 61	$2,188 61

LETHBRIDGE.

Lacombe. Group fed in Brush, 1913–14.

Lacombe. Group fed in Corral, 1913–14.



Steer Corral, Lethbridge, Alta. Note, 1, straw covered shed; 2, grain table; 3, roughage rack.

Lethbridge, Alta. Steers representing the type in Group II, 1913.

DAIRY CATTLE

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN, E. S. ARCHIBALD, B.A., B.S.A.

DAIRY CATTLE.

There are in all 140 head of cattle in temporary quarters, comprised of 102 pure-bred breeding cattle and 38 grade milch cows and heifers. All dairy cattle are kept for experimental breeding and feeding work.

PURE-BRED BREEDING CATTLE.

Ayrshires	24,	including	11	milch cows,	11	heifers,	2	males.
Canadians	25	"	14	"	6	"	5	"
Guernseys	22	"	8	"	10	"	4	"
Holsteins	21	"	10	"	8	"	3	"
Jerseys	10	"	6	"	3	"	1	"

The pure-bred herds of dairy cattle during the year 1913-1914 included only 49 milch cows.

These herds are maintained for the following reasons:—

I. To compare breeds and breed types, and illustrate the same to visitors.

II. To supply breeding stock to farmers at reasonable figures.

III. To supply milk for dairy experimental manufacture.

IV. To conduct experiments and demonstrate methods as regards the breeding, feeding, care and management of cattle.

The Holstein herd, established in 1911, has not increased as rapidly as desired, owing to the large proportion of bull calves. However, these excellent bulls have been widely distributed at reasonable figures, and will be heard from in the future. This herd is headed by the splendid young bull "King of the Ormsbys," No. 14959.

The Ayrshire herd, established in 1901, is reported smaller than previously, owing to a large number of sales. Eleven choice females were sent to the new Station at Ste. Anne de la Pocatière, Que., a few more females and a number of splendid bulls were sold to Agricultural Societies and farmers, and a few of the older cows were weeded out and sold to the butcher. This herd is headed by the well-bred bull "Monarch of Tanglewyld," No. 36442, whose progeny is of outstanding promise. The three best families of this herd trace back, in one or two generations, to "Daniel of Auchenbrain" (3586), the grandsire of "Auchenbrain Brown Kate 4th," world's champion Ayrshire cow.

The Guernsey herd, established in 1901, has not made an increase during the past year, also owing to the high proportion of bull calves and the necessary weeding out of a few of the oldest cows.

The French Canadian herd remains practically unchanged. A few choice heifers were forwarded to the Experimental Station, Cap Rouge, Que., to strengthen that herd.

The Jersey herd, established in 1911, has shown very marked improvement, especially during the latter part of the past fiscal year.

GRADE HERDS.

Grade Ayrshires	17,	including	14	milch cows,	3	heifers.
Grade Holsteins	21	"	15	"	6	"

These cows are kept for the following reasons:—

I. To supply milk for dairy experimental manufacturing.

II. To compare the high quality grade with pure-breds for economic production and in their breeding qualities.

III. To continue the upgrading of these herds as in the dairy cattle grading experiment on branch Farms.

A few excellent heifers have been produced by these grade cows, and sired by the excellent pure-bred bulls in the pure-bred herds. These calves promise even better than their dams, whose first year's record on this Farm may be found under "Milk Records" in this report.

FEEDING THE DAIRY COWS.

The year 1913-14 has been most unsatisfactory for pasture. Grass started too early in the spring, was severely injured by spring frosts, and suffered considerably from drought during July and early August. The rains of September, however, made fairly good pasture, but the loss of clover caused severe shortage, both as to quality and quantity of pasture and hay.

SUMMER FEEDING.

As in previous years, the dairy cattle were allowed only a small area for pasture, and were compelled to depend largely upon soiling crops and corn silage. As pasture, there was available only a little over 19 acres. This afforded forage for nearly a month, and was so charged.

In July and parts of August and September, soiling crops, consisting of clover, mixed peas and oats, and green corn, were fed either in the stables or in pasture.

Corn ensilage for feeding in August had been provided in 1912.

Meal was fed during the entire summer, as needed by cows in milk, and dry cows and pregnant heifers in low condition.

As formerly, during the early part of the summer, the cows were in the field during the daytime and stabled at night, but during the heat of midsummer, and as flies became more troublesome, they were housed during the day and kept in pasture at night.

WINTER FEEDING.

The winter feeding was conducted under most unfavourable conditions owing to the loss of buildings and foodstuffs by fire. Although a large quantity of splendid forage had been well preserved for winter use, yet most of this was completely ruined by fire. Of the 500 tons of corn ensilage stored in the silos of the main barn, only about 250 tons escaped injury by fire or subsequent spoiling owing to the loss of the silos, which were of wood. All the hay and straw preserved for winter feed, amounting to over 300 tons, was also lost.

The milch cows were kept in the sheep sheds until the first of December, when two temporary structures were completed for the housing of the same during the winter. All heifers and dry cows until this time were of necessity kept in the fields. However, the cattle entered these barns in the fall in good flesh and, considering the housing and food conditions, did exceptionally well.

OTTAWA.

The winter ration per day for milch cows on the average was about as follows:—

	Pounds.
Hay	5
Corn ensilage	20
Roots	15
Straw	4
Meal	7

The meal consisted of a mixture of 600 pounds bran; 300 pounds oat chop; 200 pounds oil cake meal; and 200 pounds cottonseed meal.

All the hay was purchased for the cattle which had formerly been housed in the main barn, and owing to the spring killing of clover in 1913, was mostly timothy. The corn ensilage was of good quality, rich in grain, and the part that was used for feed was uninjured.

The roots were mangels, sugar mangels, and turnips. These of necessity were fed whole owing to our lack of facilities for pulping. In the future, however, the former method of pulping and mixing with ensilage and cut straw will be continued.

The straw purchased was, of course, oat straw, and was of poor feeding value. Again, owing to lack of cutting facilities, the straw was fed long, once per day.

The meal was scattered on the ensilage after it was before the cattle. The hay given was fed uncut, after the other materials had been cleaned up.

Generally speaking, the milch cow is allowed all the roughage she will consume. Meal was given in proportion to milk produced, and if a cow responded freely and profitably to an increase of meal she was fed more liberally up to the point where profits ceased. Some of the cows, recently freshened, consumed profitably 1 pound of meal for every 3 pounds of milk produced. However, a fair average of the herd and a reasonable standard for farmers, and one which will give on the average best results, is: 1 pound of meal fed for every 4 pounds of milk produced. However, this ratio between the pounds of meal and the pounds of milk must be largely governed by the quantity and the richness of the coarse forage, together with the richness, palatability, and variety of the meal mixture.

Water was before the cows all the time; and salt was added to the roughage at the time of mixing.

DAIRY CATTLE FEEDING EXPERIMENTS.

EXPERIMENTS WITH THE FEEDING OF MOLASSES AND MOLASSES MEALS TO DAIRY CATTLE.

Following the experiments conducted in 1912-13, and already reported, on the feeding of molasses to dairy cattle, further work in relation to the value of this substance as a cattle food was carried on in the summer of 1913.

Molasses vs. Caldwell's Molasses Meal.

Beginning April 27, an experiment was conducted with the grade herd to ascertain, if possible, a comparison of the value of molasses and molasses meal added to the regular meal ration. During the test, each cow received the same number of pounds of meal and molasses, or Caldwell's molasses meal. Each feeding period consisted of two weeks; the first week as a transitory stage, the second as a basis of calculation. This allowed one week for the animals to become accustomed to any change in the ration, and by averaging the first and third periods of the experiment, a comparison

with results of the second period is possible. The following table is calculated on the feed and production of thirteen cows in the herd:—

Dairy Cow Feeding Experiment No. 3A.—Central Experimental Farm, Ottawa.

Object of Experiment.—To compare molasses with Caldwell's molasses meal.

Rations. Period 2: Meal mixture plus 25 per cent Caldwell's molasses meal. Periods 1 and 3: Meal mixture plus 20 per cent molasses.

Value of feeds per ton.—Hay, $7; straw, $4; turnips and ensilage, $2; molasses, $23; Caldwell's molasses meal, $32; meal, 1¼ cents per pound.

Grain, mixture of.—Bran, 600 pounds; gluten meal, 300 pounds; oil cake, 200 pounds; cottonseed, 200 pounds; dried brewers' grains, 200 pounds.

	Period 1	Period 3	Periods 1 and 3 average.	Period 2
Number of cows in test	13	13	13	13
Pounds of milk produced by 13 cows ..... lb	2,075	2,130	2,102	2,192
Average milk per cow per day ..... "	22·8	23·4	23·1	24
Average per cent fat in milk ..... p.c.	3·6	3·9	3·75	3·8
Total pounds fat produced by 13 cows ..... lb	74·7	83	78·8	83·29
Average pounds fat per cow per day ..... "	0·82	0·91	0·86	0·916
Total meal consumed ..... "	711	711	711	666
Total molasses or molasses meal consumed ..... "	178	178	178	223
Mixture consumed per 100 pounds fat produced .... "	1,190	1,071	1,129	1,067
Mixture consumed per 100 pounds of milk produced "	42·8	41·7	42·3	40·6
Findings from Experiment—				
Cost of meal mixture fed ..... $	11·03	11·03	11·03	11·90
Value of roughage fed ..... "	5·54	5·54	5·54	5·54
Total cost of feed ..... "	16·57	16·57	16·57	17·44
Cost to produce 100 pounds fat ..... "	22·17	19·96	21·03	20·95
Cost to produce 1 pound fat ..... "	0·221	0·199	0·21	0·209
Cost to produce 1 pound butter ..... "	0·176	0·159	0·168	0·167
Profit on 1 pound butter at 30 cents per pound ... "	0·124	0·141	0·132	0·133
Cost to produce 100 pounds milk ..... "	0·799	0·773	0·788	0·795
Profit on 100 pounds milk at $1.70 per cwt ..... "	0·901	0·927	0·914	0·915

Reviewing the results it will be seen that the production was higher during that week when the molasses constituent consisted of Caldwell's meal. The cost of production, however, is not reduced, being practically the same in all periods.

In conjunction with the foregoing work, a duplicate experiment was carried on with the pure-bred herd.

Dairy Cow Feeding Experiment No. 3 B.—Central Experimental Farm, Ottawa.

Object of Experiment.—To compare Caldwell's molasses meal with molasses.

Rations.—Period 2: Meal mixture plus 25 per cent Caldwell's molasses meal. Periods 1 and 3: Meal mixture plus 20 per cent molasses.

Value of feeds per ton.—Hay, $7; straw, $4; turnips and ensilage, $2; molesses, $23; Caldwell's molasses meal, $32; meal, 1¼ cents per pound.

Grain, Mixture of.—Bran 600 pounds; gluten meal, 300 pounds; cottonseed, 200 pounds; dried brewers' grains, 200 pounds.

	Period 1.	Period 3.	Periods 1 and 3 average.	Period 2.
Number of cows in test	11	11	11	11
Pounds of milk produced by 11 cows....lb.	2,318	2,255	2,286·5	2,283
Average milk per cow per day.... "	30	29·3	29·7	29·7
Average per cent fat in milk....p.c.	3·68	3·7	3·69	3·7
Total pounds fat produced by 11 cows....lb.	85·30	83·43	84·37	84·47
Average pounds fat per cow per day.... "	1·10	1·08	1·09	1·09
Total meal consumed.... "	576	576	576	540
Total molasses consumed.... "	144	144	144	180
Mixture consumed per 100 pounds fat produced.... "	843	864	855	851
Mixture consumed per 100 pounds milk produced... "	31·1	31·9	31·5	31·54
Findings from Experiment:—				
Cost of meal mixture fed.... $	8·93	8·93	8·93	9·63
Value of roughage fed.... "	4·36	4·36	4·36	4·36
Total cost of feed.... "	13·29	13·29	13·29	13·99
Cost to produce 100 pounds fat.... "	15·58	15·93	15·75	16·55
Cost to produce 1 pound fat.... "	0·155	0·159	0·157	0·165
Cost to produce 1 pound butter.... "	0·124	0·127	0·125	0·132
Profit on one pound butter at 30 cents per pound.. "	0·176	0·173	0·175	0·168
Cost to produce 100 pounds milk.... "	0·569	0·589	0·581	0·61
Profit on 100 pounds milk at $1·70 per cwt.... "	1·13	1·11	1·12	1·09

Here a comparison of the average of the two molasses feeding periods with the Caldwell's molasses meal period shows practically the same production in all three. Consequently, the cost of production was less where the molasses constituent was used.

In discussing the cost of production it must be remembered that the term, as here used, refers only to the actual cost of the feeds themselves. It should be stated in fairness to the molasses meals that, while they form rather an expensive food, they present molasses in a form where it may be fed as easily as any other meal. The farmer who has used feeding molasses, especially during the winter months, will realize thoroughly its inconvenience and proverbial slowness. Roughly speaking there are three ways in which molasses may be fed. The first, by simply pouring it, slightly warmed, over the feed; second, by diluting with warm water and mixing it with the roughage or meal, using a watering can or other receptacle; third, by using a mechanical power-mixer—consisting of a large hopper in which revolves a specially constructed system of mixers, operated from a horizontal spindle and driven by hand or preferably by power through chain and sprocket. In this hopper may be placed the component parts of the grain or meal mixture together with the proportion of molasses required. One or two minutes' operation will so thoroughly incorporate a 20 to 30 per cent addition of molasses that the presence of a liquid may scarcely be detected from the texture of the mixture. Such an apparatus was used in the mixture of molasses food, and while proving satisfactory as regards work done, it was mechanically weak, and with all its simplicity, much too expensive for general adoption. However, the use of some such contrivance was practically necessary where definite and differing percentages of molasses were to be used. Such items as the extra and not inconsiderable trouble of mixing, the cost of power, interest on investment, etc., were not figured against molasses.

OTTAWA.

Molasses vs. Caldwell's Molasses and Molassine Meals.

A number of the grade cows used in Experiment 3A were well advanced in their lactation periods, were decreasing rapidly in milk flow and were therefore much less likely to respond to slight changes in feeding. At the close of the experiment just mentioned, a number of high-grade, fresh-calved cows were purchased, and with them the comparison of molasses with molasses meals was continued as experiment No. 4, parts 1 and 2. In experiment 3, molasses formed the basis of experimentation, while in experiment No. 4 comparison was made from a molasses meal basis. Apart from this, no further explanation is necessary.

Dairy Cow Feeding Experiment No. 4—Part I—Central Experimental Farm, Ottawa.

Object of Experiment.—Caldwell's molasses meal vs. molasses (Caldwell's meal Standard).

Rations.—Period 2: Grain mixture plus 20 per cent molasses

Periods 1 and 3: Grain mixture plus 25 per cent Caldwell's molasses meal.

Value of feeds per ton.—Hay, $7; straw, $4; turnips and ensilage, $2; molasses, $23; Caldwell's molasses meal, $32; meal, 1¼ cents per pound.

Grain, mixture of.—Bran, 600 pounds; gluten meal, 300 pounds; oil cake, 200 pounds; cottonseed, 200 pounds; dried brewers' grains, 200 pounds.

		Period 1.	Period 3.	Periods 1 and 3 Average.	Period 2.
Number of cows in test		8	8	8	8
Pounds of milk produced by 8 cows	lb.	2,175	2,257	2,216	2,345
Average milk per cow per day	"	38·8	40	39·5	41·9
Average per cent fat in milk	p.c.	3·7	3·8	3·75	3·8
Total pounds fat produced by 8 cows	lb.	79·47	85·76	83·10	89·11
Average pounds fat per cow per day	"	1·42	1·53	1·48	1·59
Total meal consumed	"	483	483	483	515
Total molasses consumed	"	161	161	161	129
Mixture consumed per 100 pounds fat produced	"	810·3	750·9	774·8	722·7
Mixture consumed per 100 pounds milk produced	"	29·6	28·5	29	27·4
Findings from Experiment.—					
Cost of meal mixture fed	$	8·62	8·62	8·62	7·99
Value of roughage fed	"	3·55	3·55	3·55	3·55
Total cost of feed	"	12·17	12·17	12·17	11·54
Cost to produce 100 pounds fat	"	15·31	14·19	14·64	12·95
" " 1 "	"	0·153	0·141	0·146	0·129
" " 1 " butter 80 per cent	"	0·122	0·112	0·116	0·103
Profit on 1 pound butter at 30 cents per pound	"	0·178	0·188	0·184	0·197
Cost to produce 100 pounds milk	"	0·559	0·539	0·549	0·493
Profit on 100 pounds milk at $1.70 per cwt.	"	1·14	1·16	1·15	1·20

In the above experiment, comparing molasses feeds on a Caldwell's molasses meal standard, the eight cows gave an appreciably greater response during the period when they received the 20 per cent molasses addition to the meal mixture. This, combined with the lower cost of the ration, reduced the cost of production during the molasses feeding period. No effect was noticed in the average percentage fat during the different periods.

Dairy Cow Feeding Experiment No. 4—Part II—Central Experimental Farm, Ottawa.

Object of Experiment.—Molassine *vs.* Molasses (Molassine standard).

Rations.—Period 2: Meal mixture plus 20 per cent molasses.

Periods 1 and 3: Meal mixture plus 25 per cent Molassine meal.

Value of feeds per ton: Hay, $7; straw, $4; turnips and silage, $2; molasses, $23; Molassine meal, $37; meal, 1¼ cents per pound.

Grain, mixture of.—Bran, 600 pounds; gluten meal, 300 pounds; oil cake, 200 pounds; cottonseed, 200 pounds; dried brewers' grains, 200 pounds.

		Period 1.	Period 3.	Periods 1 and 3 Average.	Period 2.
Number of cows in test		8	8	8	8
Pounds of milk produced by 8 cows	lb.	2,138	2,084	2,111	2,138
Average milk per cow per day	"	38	37	37·5	38
Average per cent fat in milk	p.c.	3·6	3·5	3·55	3·6
Total pounds fat produced by 8 cows	lb.	76·96	72·94	74·94	76·96
Average pounds fat per cow per day	"	1·36	1·29	1·30	1·30
Total meal consumed	"	483	483	483	515
Total molasses consumed	"	161	161	161	129
Mixture consumed per 100 pounds fat produced	"	836·7	882·9	859·3	836·7
Mixture consumed per 100 pounds milk produced	"	30·1	30·9	30·5	30·1
Findings from Experiment.—					
Cost of meal mixture fed	$	8·94	8·94	8·94	7·99
Value of roughage fed	"	3·55	3·55	3·55	3·55
Total cost of feed	"	12·59	12·59	12·59	11·54
Cost to produce 100 pounds fat	"	16·35	17·26	16·80	15·00
" " 1 "	"	0·163	0·172	0·168	0·15
" " 1 " butter 80 p.c.	"	0·13	0·137	0·134	0·12
Profit on 1 pound butter at 30 cents per pound	"	0·17	0·163	0·166	0·18
Cost to produce 100 pounds milk	"	0·58	0·60	0·59	0·54
Profit on 100 pounds milk at $1.70 per cwt	"	1·11	1·09	1·10	1·16

In part 2 of this experiment, Molassine meal was used during the first and third periods. The production of the periods decreases slightly, due to a great extent to the fact that the cows were housed continually during comparatively warm weather. Here again the average for the two Molassine meal feeding periods is slightly lower than where molasses is used, resulting in practically the same lessening in cost with the latter food that was shown in part 1.

The tests as outlined were conducted with comparatively few cows, and under conditions not altogether conducive to thorough contentment on the part of the animals, and are, perhaps, rather inconclusive. One point is fairly well shown, namely, that molasses added to the meal ration is more palatable, cheaper, and capable of producing more milk than any of the above molasses meals used. The palatability of molasses is unquestionable. During the first week of each two-week period, the cows were unmistakably glad to welcome the molasses mixed meal. When, on the contrary, they were changed to the meal mixture plus the molasses meals, they showed a lack of enthusiasm. Attention might here be drawn to the fact that in purchasing molasses meals, great care should be taken to examine them and ascertain that they are reasonably fresh. The matrix or solid portion of these meals consists in most cases of peat, sphagnum moss, ground sugar cane or other more or less edible organic material of an absorbent nature. With these substances, in a finely-ground state, is incorporated the molasses, the whole being, when freshly mixed, of a soft mealy consistency and a palatable nature. Where, however, large quantities of such meals are stored, piled high in warehouses, the result is a compacting of the material and, in warm weather,

more or less fermentation, leaving the contents of each bag a solid "fire-fanged" mass, with adhesive qualities sufficient to make disintegration almost impossible. The feeding value, palatability, and convenience of molasses meal in such a condition is destroyed. With Molassine meal, some difficulty was met with in obtaining the fresh-mixed product on the open market. This meal in the foregoing experiments and in experiment 5 was not of the best quality. With Caldwell's molasses meal, however, no such trouble was experienced, it being uniformly fresh and sweet wherever purchased, and apparently able to retain these qualities indefinitely. To this was likely due the fact that throughout the experiments cattle showed a preference for this meal over other meals of like nature. Where purchased in any considerable quantity, the bags containing molasses meals should either be placed on end or piled flat in tiers not more than 3 or 4 deep.

COMPARISON OF MOLASSES MEALS.

For the winter of 1913-14, due to the destruction of all machinery and special appliances used in molasses feeding, investigations in this line were necessarily confined to a straight comparison of molasses meals. Of these, three were chosen, Caldwell's molasses meal, Molassine meal, and Molascuit. The two first-mentioned have already been used as reported. The latter, however, is a newer meal, and is composed of refuse sugar cane and pulp, ground and dried, mixed with cane feeding molasses. Although it does not impress one at first sight as an attractive or palatable meal, this feature is not apparent in the results, which show little difference in the production for the various feeding periods.

The operation of these tests was very seriously interfered with by frequent changes in the herd, individuals being removed temporarily and returned, or permanently disposed of and replaced by new cows. This was necessitated by crowding and the frequent changing of stock in all quarters due to lack of housing facilities and to other untoward circumstances not under control. In experiment No. 5, therefore, only six cows were available, these cows being in good milk flow and in the grade herd under uniform conditions throughout the test.

In order to give a fair comparison, the results of the tests are compiled in three tables, in each of which the basic Molassine meal is compared with one of the three-meal rations plus Molascuit, plus Caldwell's molasses meal, and less molasses meal constituent. Molasses meal was therefore fed during periods 1 and 3, 3 and 5, and 5 and 7. In the intermediate period in each case comparison was possible with the other molasses meals or with the mixture less molasses by averaging the two Molassine meal feeding periods. This is the fairest comparison possible, as it allows for the natural decrease in milk flow. In the case of a direct comparison of two feeding periods, the later is always at a disadvantage, due to the natural falling off in production.

The preface appearing at the top of the first table contains information applying of course to the two tables following.

Dairy Cow Feeding Experiment No. 5—Central Experimental Farm, Ottawa.

Object of Experiment.—To compare molasses meals (Molassine meal standard).

Rations.—Period 1, 3, 5, 7: Meal mixture plus Molassine meal.
Period 2: Meal mixture less molasses meal.
Period 4: Meal mixture plus Molascuit.
Period 6: Meal mixture plus Caldwell's molasses meal.

Value of Feeds per ton.—Hay, $7; straw, $4; roots and ensilage, $2; molasses, $23; Caldwell's molasses meal, $32; Molassine meal, $37; Molascuit, $32; regular meal mixture, 1¼ cents per pound.

Grain and Molasses Meal Mixture.—Bran, 400 pounds; gluten feed, 200 pounds; nutted oil cake, 200 pounds; molasses meal (make depending on experiment) 200 pounds.

OTTAWA.

Ayrshire cow, Flavia 2nd of Ottawa, 22,197. Official record for year 1912:—10,318·5 lb. milk, 414·8 lb. fat in 330 days. Official record for year 1913:—9,520·5 lb. milk, 374·8 lb. fat in 317 days. Bred and owned by Central Experimental Farm, Ottawa.

Ayrshire cow, Ottawa Kate, 29,601. Official record for year 1913:—11,873 lb. milk, 478·7 lb. fat in 365 days. Bred and owned by Central Experimental Farm, Ottawa. Her dam is a full sister of the dam of world's champion Ayrshire cow Auchenbraine Brown Kate 4th.

COMPARING Molassine Meal with Meal Ration less molasses.

		Period 1. — Molassine.	Period 3. — Molassine.	Periods 1 and 3 Average. — Molassine.	Period 2. — Less Molasses.
Number of cows in test		6	6	6	6
Pounds of milk produced by six cows	lb.	1,062·5	1,087	1,074·7	1,141·5
Average milk per cow per day	"	25·3	25·9	25·6	27·1
Average per cent fat in milk	"	3·4	3·5	3·45	3·4
Total pounds fat produced by six cows	"	36·2	38	37·1	38·8
Average pounds fat per cow per day	"	·86	·90	·88	·92
Total meal consumed	"	336	336	336	420
Total molasses meal consumed	"	84	84	84	
Mixture consumed per 100 pounds fat produced	"	1,160	1,105	1,132·5	1,082
Mixture consumed per 100 pounds milk produced	"	39·5	38·7	39·1	37·
Findings from Experiment.—					
Cost of meal mixture fed	$	5·71	5·71	5·71	5·25
Value of roughage fed	"	3·94	3·94	3·94	3·94
Total cost of feed	"	9·65	9·65	9·65	9·19
Cost to produce 100 pounds fat	"	26·65	25·13	25·89	23·71
Cost to produce 1 pound fat	"	0·266	0·25	0·258	0·23
Cost to produce 1 pound butter	"	0·212	0·20	0·206	0·184
Profit on 1 pound butter at 30 cents per pound	"	0·08	0·10	0·09	0·11
Cost to produce 100 pounds milk	"	0·908	0·888	0·898	0·805
Profit on 100 pounds milk at $1.70 per cwt	"	0·792	0·812	0·802	0·895

The outstanding feature of the results, as indicated, is the appreciable increase in production when the Molassine meal was omitted from the ration. This increase, combined with the lower cost of the ration less molasses, resulted in a considerably lower cost of production during period 2.

Dairy Cow Feeding Experiment No. 5—Central Experimental Farm, Ottawa.

COMPARING Molassine Meal with Molascuit.

		Period 3. — Molassine.	Period 5. — Molassine.	Periods 3 and 5 Average — Molassine.	Period 4. — Molascuit.
Number of cows in test		6	6	6	6
Pounds of milk produced by six cows	lb.	1,087	1,004	1,046	1,065
Average milk per cow per day	"	25·9	23·9	24·9	25·3
Average per cent fat in milk	p.c.	3·5	3·6	3·55	3·5
Total pounds fat produced by six cows	lb.	38	36·1	37·1	37·2
Average pounds fat per cow per day	"	·90	·86	·88	·38
Total meal consumed	"	336	336	336	3368
Total molasses meal consumed	"	84	84	84	84
Mixture consumed per 100 pounds fat produced	"	1,105	1,163	1,134	1,129
Mixture consumed per 100 pounds milk produced	"	38·7	41·8	40·3	39
Findings from Experiment.—					
Cost of meal mixture fed	$	5·71	5·71	5·71	5·55
Value of roughage fed	"	3·94	3·94	3·94	3·94
Total cost of feed	"	9·65	9·65	9·65	9·49
Cost to produce 100 pounds fat	"	25·13	26·73	25·93	25·51
Cost to produce 1 pound fat	"	0·25	0·267	0·259	0·255
Cost to produce 1 pound butter	"	0·20	0·213	0·207	0·204
Profit on 1 lb. butter at 30 cents per pound	"	0·10	0·087	0·093	0·096
Cost to produce 100 pounds milk	"	0·888	0·96	0·924	0·89
Profit on 100 pounds milk at $1.70 per cwt	"	0·812	0·74	0·776	0·81

The results show a slightly increased production during the period in which was fed Molascuit as compared with the average of the two Molassine meal periods. Molascuit being lower in cost than Molassine, the cost of production for period 4 is still further lowered.

Dairy Cow Feeding Experiment No. 5.—Central Experimental Farm, Ottawa.—Con.

COMPARING Molassine Meal with Caldwell's Molasses Meal.

		Period 5.	Period 7	Periods 5 and 7 Average.	Period 6.
		Molassine.	Molassine.	Molassine.	Caldwell's Molasses Meal.
Number of cows in test	lb.	6	6	6	6
Pounds of milk produced by six cows	"	1,004	1,014·5	1,009·2	1,049
Average milk per cow per day	"	23·9	24·1	24·	25
Average per cent fat in milk	"	3·6	3·7	3·65	3·6
Total pounds fat produced by six cows	"	36·1	37·5	36·8	37·7
Average pounds fat per cow per day	"	·86	·89	·875	·90
Total meal consumed	"	336·	336	336	336
Total molasses meal consumed	"	84	84	84	84
Mixture consumed per 100 pounds fat produced	"	1,163	1,120	1,142	1,114
Mixture consumed per 100 pounds milk produced	"	41·8	41·4	41·6	40
Findings from Experiment.—					
Cost of meal mixture fed	$	5·71	5·71	5·71	5·55
Value of roughage fed	"	3·94	3·94	3·94	3·94
Total cost of feed	"	9·65	9·65	9·65	9·49
Cost to produce 100 pounds fat	"	26·73	25·73	26·23	25·17
Cost to produce 1 pound fat	"	0·267	0·257	0·262	0·25
Cost to produce 1 pound butter	"	0·213	0·205	0·209	0·20
Profit on 1 pound butter at 30 cents per pound	"	0·087	0·095	0·091	0·10
Cost to produce 100 pounds milk	"	0·96	0·95	0·955	0·904
Profit on 100 pounds milk at $1.70 per cwt.	"	0·74	0·75	0·745	0·796

Here the results are in favour of the Caldwell's molasses meal, milk production being slightly higher, and cost to produce lessened accordingly, the lower price of the latter meal still further reducing the cost.

SUMMARY.

The feeding periods with the meal mixture plus Molascuit, meal mixture plus Caldwell's molasses meal, and meal mixture less molasses, all show increased production over the average of a preceding and following Molassine meal feeding period. The lower price of the three former meal mixtures, combined with the above fact, quite appreciably lessens the cost to produce.

COMPARING MOLASSES MEALS FROM A CALDWELL'S MEAL STANDARD.

At the expiration of the foregoing experiment, the test was continued on the above indicated basis. A number of high-class Holstein and Ayrshire grades having been purchased, and several individuals of the herd having freshened, eleven cows were available, all at a stage of lactation where production would likely be affected by change in diet.

Except for the change in the basis of comparison, experiment 6 was practically a replica of experiment 5. The results being tabulated as in experiment 5, no further explanation should be required.

OTTAWA.

Dairy Cow Feeding Experiment No. 6.—Central Experimental Farm, Ottawa.

Object of Experiment.—To compare molasses meals. (Caldwell's molasses meal standard).

Rations: Periods 1, 3, 5 and 7: Meal mixture plus Caldwell's molasses meal.

Period 3: Meal mixture plus Molascuit.

Period 5: Meal mixture plus Molassine meal.

Period 7: Meal mixture less molasses meal.

Value of feeds per ton.—Hay, $7; straw, $4; ensilage, $2; Caldwell's molasses meal, $32; Molascuit, $32; Molassine meal, $37; meal, 1¼ cent per pound.

Grain and Molasses Meal Mixture.—Bran, 400 pounds; gluten feed, 200 pounds; nutted oil cake, 200 pounds; molasses meal (make depending on experiment) 200 pounds.

COMPARING Caldwell's Molasses Meal with Molascuit.

	Period 1 — Caldwell's Molasses Meal	Period 3 — Caldwell's Molasses Meal	Periods 1 and 3 Average. — Caldwell's Molasses Meal	Period 2 — Molascuit.
Number of cows in test	11	11	11	11
Pounds of milk produced by 11 cows.....lb.	2,699·	2,520·	2,609·5	2,638·
Average milk per cow per day..... "	35·	32·7	33·8	34·2
Average per cent fat in milk.....p.c.	3·9	3·9	3·9	3·9
Total pounds of fat produced by 11 cows.....lb.	105·2	98·2	101·7	102·9
Average pounds fat per cow per day..... "	1·36	1·27	1·32	1·34
Total meal consumed..... "	941·	941·	941·	941·
Total molasses meal consumed..... "	235·	235·	235·	235·
Mixture consumed per 100 pounds fat produced.... "	1,118·	1,197·	1,157·5	1,197·
Mixture consumed per 100 pounds milk produced.. "	43·5	46·6	45·5	46·6
Findings from Experiment.—				
Cost of meal mixture fed..... $	15·52	15·52	15·52	15·52
Value of roughage fed..... "	4·38	4·38	4·38	4·38
Total cost of feed..... "	19·90	19·90	19·90	19·90
Cost to produce 100 pounds fat..... "	18·91	20·26	19·58	19·34
Cost to produce 1 pound fat..... "	0·189	0·202	0·195	0·193
Cost to produce 1 pound butter..... "	0·151	0·161	0·156	0·154
Profit on 1 pound butter at 30 cents per pound.... "	0·149	0·139	0·144	0·146
Cost to produce 100 pounds milk..... "	0·741	0·789	0·765	0·754
Profit on 100 pounds milk at $1.70 per cwt..... "	0·959	0·911	0·935	0·946

The results for the average of the Caldwell's molasses meal feeding periods, as against the Molascuit period, were practically the same both as to production and cost to produce.

Dairy Cow Feeding Experiment No. 6.—Central Experimental Farm, Ottawa.—Con.

Comparing Caldwell's Molasses Meal with Molassine Meal.

	Period 3. Caldwell's Molasses Meal.	Period 5. Caldwell's Molasses Meal.	Periods 3 and 5 Average. Caldwell's Molasses Meal.	Period 4. Molassine Meal.
Number of cows in test	11	11	11	11
Pounds of milk produced by 11 cows....lb.	2,520·	2,438·	2,479·	2,402·
Average milk per cow per day.... "	32·7	31·6	32·2	31·1
Average per cent of fat in milk....p.c.	3·9	3·8	3·85	3·8
Total pounds of fat produced by eleven cows....lb.	98·2	92·6	95·4	91·2
Average pounds fat per cow per day "	1·27	1·20	1·24	1·18
Total meal consumed.... "	941·	941·	941·	941·
Total molasses consumed.... "	235·	235·	235·	235·
Mixture consumed per 100 pounds fat produced.... "	1,197·	1,270·	1,234·	1,289·
Mixture consumed per 100 pounds milk produced.. "	46·6	48·5	47·6	48·9
Findings from Experiment.—				
Cost of meal mixture fed....$	15·52	15·52	15·52	16·00
Value of roughage fed....	4·38	4·38	4·38	4·38
Total cost of feed....	19·90	19·90	19·90	20·38
Cost to produce 100 pounds fat....	20·26	21·49	20·88	22·34
Cost to produce 1 pound fat....	0·202	0·214	0·208	0·223
Cost to produce 1 pound butter....	0·161	0·171	0·166	0·178
Profit on 1 pound butter at 30 cents per pound....	0·137	0·129	0·134	0·122
Cost to produce 100 pounds milk....	0·789	0·812	0·801	0·848
Profit on 100 pounds milk at $1.70 per cwt....	0·911	0·888	0·899	0·852

The average of the Caldwell's meal periods was here higher than the Molassine period, and in conjunction with the lower cost of the former meal the total cost to produce was consequently lowered.

Comparing Caldwell's Molasses Meal with a Meal Ration less Molasses.

	Period 5 Caldwell's Molasses Meal.	Period 7. Caldwell's Molasses Meal.	Periods 5 and 7 Average. Caldwell's Molasses Meal	Period 6. Meal Ration less Molasses.
Number of cows in test....	11	11	11	11
Pounds of milk produced by 11 cows....lb.	2,438·	2,202·	2,320·	2,199·
Average milk per cow per day.... "	31·6	28·5	30·1	28·5
Average per cent fat in milk....p.c.	3·8	3·6	3·7	3·7
Total pounds fat produced by 11 cows....lb.	92·6	79·3	86·	81·4
Average pounds fat per cow per day.... "	1·20	1·02	1·21	1·05
Total meal consumed.... "	941·	941·	941·	1,176·
Total molasses meal consumed.... "	235·	235·	235·	
Mixture consumed per 100 pounds fat produced.... "	1,270·	1,482·	1,376·	1,444·
Mixture consumed per 100 pounds milk produced....	48·5	53·4	51·	53·4
Findings from Experiment.—				
Cost of meal mixture fed....$	15·52	15·52	15·52	14·60
Value of roughage fed.... "	4·38	4·38	4·38	4·38
Total cost of feed.... "	19·90	19·90	19·90	18·98
Cost to produce 100 pounds fat.... "	21·49	25·09	23·29	23·32
Cost to produce 1 pound fat.... "	0·214	0·25	0·232	0·233
Cost to produce 1 pound butter.... "	0·171	0·20	0·185	0·186
Profit on 1 pound butter at 30 cents per pound.... "	0·129	0·10	0·115	0·114
Cost to produce 100 pounds milk.... "	0·812	0·90	0·856	0·863
Profit on 100 pounds milk at $1.70 per cwt.... "	0·888	0·80	0·844	0·837

Caldwell's molasses meal here showed a considerable superiority over the ration less molasses. In the previous experiment exactly the reverse was the case, quite as decided a rise being shown when the molasses meal was omitted. Notwithstanding the drop in production in this case, however, the cost to produce was very little higher, due to the absence, in period 6, of the relatively expensive Caldwell's meal.

GENERAL CONCLUSIONS.

Reviewing the results as obtained throughout the year it would appear that in view of their relatively high cost, molasses meals tend to increase the cost of milk production. Comparing them with the pure molasses addition, the results are not as conclusive as might be desired in order to make deductions. The cost to produce, as figured, is lower with molasses, which is more palatable, and looks to be a better milk producer than the meals. It is a foodstuff of inconvenient nature, however, and the necessary expense involved in its incorporation with the food, must not be forgotten. Among the meals themselves, Caldwell's molasses meal has shown a slight but consistent superiority. This may have been due to the fact that, when purchased, it was uniformly fresh. Although results as to milk production were contradictory when compared with a meal mixture less molasses, the addition of molasses meals to a well-balanced ration, as largely home-grown as possible, would be of doubtful benefit, when the question is viewed in the last analysis—the cost to produce. However, this is the first test of its kind to be conducted at the Central Experimental Farm, and no further attempt should be made at hard and fast deductions.

Below is given a table of the weights of the cows taken at the beginning of experiments 5 and 6 and at the end of each feeding period throughout the tests.

WEIGHTS OF CATTLE AT END OF FEEDING PERIODS.

Experiment No. 5.

	At Beginning of Experiment.	Period 1.	Period 2.	Period 3.	Period 4.	Period 5.	Period 6.	Period 7.	Period 8.
6 cows	6,645	6,795	6,769	6,712	7,013	6,707	6,847	6,654	.....

Experiment No. 6.

11 cows	11,432	11,617	11,618	11,660	11,944	11,920	11,886	11,875	11,905

The results, although interesting, do not permit of any deductions bearing on the excellence of the meals tested.

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GUARANTEED ANALYSES.

In connection with the foodstuffs used in the foregoing experiments, the following analyses, as quoted by manufacturers, may be of interest. Further analyses will be made by the Chemical Division, of composite samples of these foods, taken during the period of experiment.

GUARANTEED ANALYSES.

Foodstuff	Protein.	Carbohydrate.	Fat.	Fibre.
	%	%	%	%
Bran—				
(Ontario and Manitoba Flour Mills)	11·9	42·	2·5	.....
Gluten Feed—				
(Canada Starch Co.)	23·	.....	3·	6·
Nutted Oil Cake—				
(Sherwin Williams Co.)	31·5	35·7	3·	.....
Cotton Seed Meal—				
(Michigan Farmer Brand)	41–48	.....	7–12	4–10

GUARANTEED ANALYSES (Molasses Meals).

Meal.	Moisture.	Protein.	Carbohydrate and Digestible Fibre.	Sugar.	Fat.	Fibre.	Ash.
	%	%	%	%	%	%	%
Molascuit	15·33	2·50	69·02	53·19	·13	6·23	6·75
Caldwell's	.....	4·61	64·56	39·16	·81	2·71	.....
Molassine	19·23	7·94	55·48	.....	1·06	6·87	9·42

Molascuit.—Composed of the interior of the sugar cane after the juice has been expressed this material, after screening and drying, is known as Megass meal, is said to be 75 per cent digestible, and, furthermore, is capable of absorbing four times its weight of molasses, the original juice being largely replaced by molasses.

Caldwell's Molasses Meal.—Composed of 80 to 84 per cent pure cane molasses, and the balance sphagnum moss.

Molassine Meal.—Much similar in composition to Caldwell's, sphagnum moss or peat forming the absorbent matrix which holds a high percentage of molasses.

ANALYSES BY THE DIVISION OF CHEMISTRY.

Readers interested in the above as well as all other live stock feeding experiments are referred to the report of the Dominion Chemist, as contained in previous chapters of this volume, for the analyses of all the various foodstuffs under experiment. Such analyses are absolutely essential in the final deductions relating to any feeds. The

foregoing "guaranteed analyses" are available to all purchasers who request such from sales agents. Whether or not such feeds are uniform in composition or live up to the guaranteed analyses, can be proven only by careful sampling and analysing by a chemist.

The following analyses were made by Mr. F. T. Shutt, Dominion Chemist, who has done a large amount of work relating to molasses as a foodstuff. These figures are here copied to illustrate the above-mentioned comparisons. Readers are particularly referred to complete analyses and explanatory notes as contained in the report of the Dominion Chemist.

Samples Nos. 1 and 2 were analysed a year ago and reported in the annual report for the year ending March 31, 1913. Samples Nos. 3, 4, and 5 were analysed during the past year, complete details of which are found in previous chapters of this report.

No.	Feed.	Moisture.	Protein.	Carbo-hydrate.	Sugar.	Fat or Oil.	Fibre.	Ash.
		%	%	%	%	%	%	%
1	Molascuit Meal	16·10	2·81	66·23	43·70	·20	6·97	7·69
2	Molassine Meal	21·45	8·44	56·29	39·12	·35	5·44	8·07
3	Molassine Meal	17·06	6·34	58·23	35·32	·68	10·55	6·99
4	Caldwell's meal	22·04	4·89	58·22	44·86	·46	7·03	7·36
5	Molasses	28·70	4·94	60·95	60·57	.....	.....	5·41

Whether or not these meals were representative of their respective brands cannot be said. These, however, were all purchased on the market, and should be representative.

Comparisons of the above analyses with the results of the feeding experiments are most interesting. Final deductions would be impossible owing to the shortness of the test, yet one most noticeable fact may be noted, namely, in the above experiments the food values of molasses and molasses meals are in the same order and proportion to their sugar content, while the protein might be largely discarded in calculations as being mostly indigestible.

MILKING MACHINES.

As reported in the annual report for the fiscal year ending March 31, 1913, considerable work has been done at the Central Experimental Farm in connection with milking machines. Although nothing of a definite nature is as yet ready for publication, a brief summary of operations to date is worthy of note.

In July, 1912, a Sharples mechanical milker was installed in the main barn of the Central Experimental Farm with an idea of testing thoroughly this method of milking, and this machine in particular, as to its commercial value, its economy, durability, the effect on the cows as compared with hand milking, and particularly on the bacterial quality of the milk produced. Six milking units of this mechanical milker, together with all necessary equipment, including an electric motor, were installed with a total cost of $1,043. Each milking unit cost $110, with the pump, vacuum tanks, etc., extra. To readers who are not acquainted with milking machines, attention is drawn to the fact that with the Sharples mechanical milker a milking unit milks only one cow at a time.

In September, 1913, another make of milking machine, namely, the Burrell-Lawrence-Kennedy, was also installed in the main barn of the Central Experimental Farm. The reason for this installation was to obtain comparative data between the Burrell-

Lawrence-Kennedy, the Sharples, and eventually other makes of mechanical milkers, in contrast to good hand milking. This installation did not in any way mean the discarding of the first installed machine. A complete outfit of the Burrell-Lawrence-Kennedy milker, consisting of three double milking units, together with all necessary appliances and incidentals, was installed, the one motor, however, being capable of handling the two makes of mechanical milkers. The cost of the Burrel-Lawrence-Kennedy milker amounted to $109 per milking unit, with extra for the pump, tank, and valves. A unit of this machine consists of a milk pail, cover with pulsator attached, eight teat cups and all rubber tubing. One unit of the Burrell-Lawrence-Kennedy machine milks two cows at a time, in contrast to one cow at a time in the Sharples machine.

The fire which destroyed the main barn in October, 1913, also destroyed all piping, motors, pumps, vacuum tanks, etc., of both of these makes of mechanical milkers and, in consequence of the loss of buildings and this part of the equipment, it was deemed advisable to discontinue experimental work with milking machines until the completion of the new structure, when all such work will be much enlarged and continued.

The Sharples mechanical milker had been in use for fifteen months, excepting check periods of hand milking, amounting to approximately three months. The Burrell-Lawrence-Kennedy machine was in use just one month previous to the fire. Comparisons between these two machines in any way would be utterly impossible owing to the fact that the latter installed machine was used for such a short time and also that the former machine had in a way prepared the cows for mechanical milking. However, with the ten months of hand milking subsequent to the loss of buildings, all herds will be in a position on a uniform basis to take up the experimental work comparing these two machines with hand milking.

The bacteriological study for purity of milk in this work has, in the past, been conducted by Miss L. Dean, and with the assistance and under the supervision of the Dominion Botanist, Mr. H. T. Güssow. Many new bacterial phases of this work will be taken up as soon as this experimental work with mechanical milkers is re-established.

A brief summary of results with the Sharples mechanical milker to date is as follows:—

Although uniform conditions as to cleanliness of barn, cattle, etc., were maintained, yet with the best methods possible adopted, certified milk was an impossibility with the Sharples machine, while, with difficulty, it was possible by the best of hand milking. For good pure milk the Sharples mechanical milker gave good results if special precautions were taken in the washing and sterilizing of the milker after each milking period. The utility of this mechanical milker in the production of pure milk depends absolutely on the man who is operating the same, both as to cleanliness of the cows, care in handling the machine during operation, and thorough sterilization of the machine before using.

This machine apparently had no ill effect upon the cattle, only a few objecting to its use at the commencement of the experiment, and all taking kindly to it in a short time.

As to economy of labour, it undoubtedly has decreased the labour of milking fully 50 per cent but, on the other hand, has largely increased the labour in washing and sterilizing of all utensils. Generally speaking, it has decreased the most important labour of milking to an extent which would warrant the installation of the machine in a herd of some dimensions—fifteen cows or more.

Apparently the machine has exerted some influence in hastening the end of the lactation period; however, as it was the first year of installation, no definite figures or no definite conclusions could be drawn.

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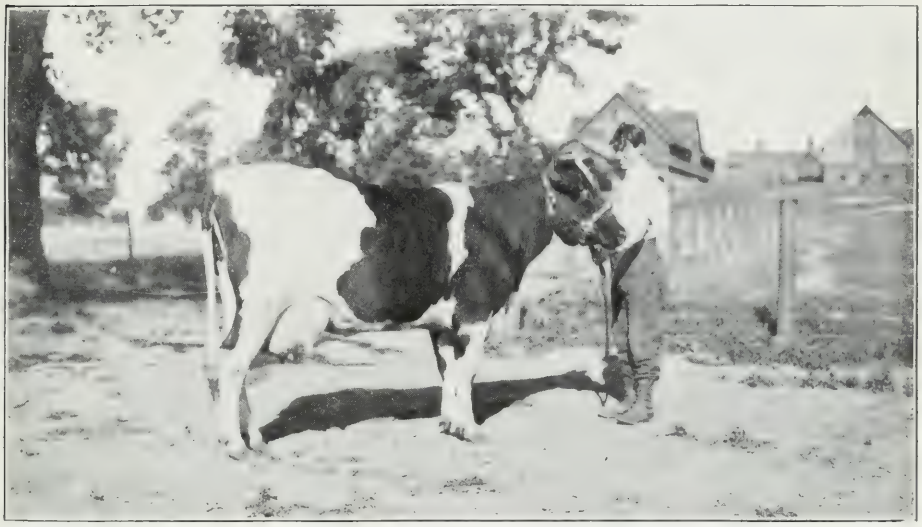
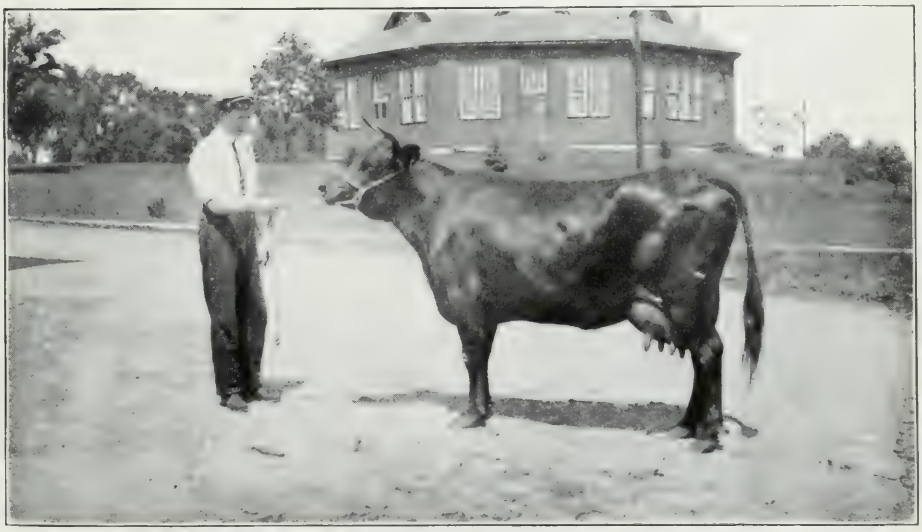


Holstein cow "Evergreen March," official records as 3 years in 1913:—Record of performance—13,804 lb. milk testing 3·8 % fat, or 525·4 lb. fat in 335 days. Record of milk, 3 years, 5 months, 1 day:—7 days: 549·5 lb. milk, 19·38 lb. fat, 24·22 lb. butter; 30 days: 2,202·5 lb. milk, 74·86 lb. fat, 93·58 lb. butter. Owned by Central Experimental Farm, Ottawa.



French Canadian cow, Fortune 4th, of Ottawa, age 5 years. Record of performance, 1913:—9,127 lb. milk testing 4·42 % fat; 410·02 lb. fat 365 days. Bred and owned by Experimental Farm, Ottawa.

The cost of renewal of rubber linings for teat cups and rubber tubing amounted to more than was expected. However, the manufacturers of the Sharples machine have, during the year 1913, greatly improved the finish and quality of the machine, both as to rubber parts and also as to the smoothness of the metal surfaces, which will greatly overcome part of the difficulty in washing and thorough sterilizing.

Further conclusions would be unwarranted owing to the short duration of the experiment. However, it is hoped that after three or more years of careful study of this and other mechanical milkers, a large amount of definite information of valuable character will be available for distribution.

DAIRY HERD RECORDS.

Following are the dairy cow milk records for all cows which have finished a lactation period during the fiscal year ending March 31, 1914.

In the case of heifers with their first calves, charges for feed include the consumption from a date two months previous to parturition, to the time of being dried off preparatory to second calving. In the case of heifers and cows 3 years old and over, charges for feed include the period in which they were dry previous to the lactation period reported.

In estimating the cost of feeding the following values are used:—

Pasture, per month	$ 1 per cow.
Meal mixture	25 per ton.
Hay	7 "
Straw	4 "
Roots and ensilage	2 "
Green feed	3 "

In calculating the value of the product, 30 cents per pound is allowed for the butter, and 20 cents per hundred pounds for skim-milk. In reality a considerable quantity of milk conforming to the "certified" standard has again been sold at $3 per hundred pounds, while the price of butter ranged from 29 to 35 cents per pound. The cream cheeses sold realized from $3.25 to $3.50 per hundred pounds of milk, and the Coulommier cheeses sold realized from $2.20 to $3 per hundred pounds of milk. The skim-milk, too, has acquired a value much exceeding the 20 cents per hundred pounds. In many cases, in the feeding of either calves or young pigs, it has reached a value of 75 cents and, in exceptional cases, nearly a dollar per hundred pounds.

However, the figures chosen for calculation were regular market values, and form a fair basis for comparison of the various individuals in the herd with each other, for this and previous fiscal years, as well as with the individuals of other herds either on branch Farms and Stations or on the farms of private individual farmers.

In computing these returns it will be noted that the bedding and labour in connection with caring for the cattle, and also the manufacture of the butter, cost of handling milk, manufacturing of cheese, and the like, have not been taken into account. From careful calculation covering several years it has been found that the value of the manure made and the value of the calves at birth, if properly cared for, more than counterbalance the above-mentioned items.

All cows are reported upon that have finished a lactation period during the past fiscal year. This list, however, does not include all cows that are at present in milk on the Central Experimental Farm, for in a few cases the cows have overrun the full year milking, and many heifers have not completed their first lactation period.

Owing to the loss of the splendid roughage together with the complete winter's supply of meals, all dairy cows on the Farm suffered severely from lack of a well-balanced ration, until such time as sufficient materials could be purchased for the same.

OTTAWA.

In comparing the results from the various herds, special note must be made of the fact that the barn in which the grade cows were housed was not lost by fire, only the main barn and its various wings, in which all the pure-bred dairy cattle were housed, being destroyed. In consequence, the grade cows had, during the latter half of the fiscal year, a very much better opportunity than did the pure-breds, as they were not seriously affected by the fire.

OFFICIAL RECORDS OF PRODUCTION.

Although the herd records on the Central Experimental Farm are considered official, yet the policy of the Farms has been to place individual cows under test similar to cows of private individuals, and conduct the same under similar supervision. In consequence of this policy, pure-bred individual cows from the various herds on the Central Experimental Farm have, during the past years, been entered in the Record of Performance and, added to this during the past fiscal year, a few individual Holsteins were entered in the Canadian Holstein Friesian Association Record of Merit.

Following is a list of the cows which have completed these official records during the past fiscal year:—

CANADIAN Record of Performance.

Name of cow.	Breed.	Age at commencement of test.	Number days milking.	Pounds milk produced.	Pounds fat produced.	Average per cent. fat.
Evergreen March 3rd	Holstein.	3	335	13,804	525·48	3·8
Ottawa Kate	Ayrshire	7	365	11,873	478·70	3·9
Flavia 2nd	Ayrshire	8	317	9,520	374·84	3·94
Fortune 4th of Ottawa	Fr. Canadian.	5	365	9,127	410·02	4·42
Aromaz	" "	5	360	7,712	415·86	5·33
Inequette 3rd	" "	5	365	6,763	315·28	5·01
Fortune Cadette	" "	3	319	5,801	287·00	4·71

CANADIAN Holstein Friesian Record of Merit.

Name of Cow.	Age at commencement of test.	No. of days in test	Pounds milk produced.	Pounds fat produced.	Pounds 80 per cent. butter produced.
Evergreen March 3rd (12659)	3y., 5m., 10d.	7	549·5	19·38	24·22
		30	2,202·5	74·86	93·58
Beulah Clay (7,705)	6y., 0m., 27d.	7	472	16·79	20·99
		30	1,897	59·96	74·95
Centre View Bessie Ann (12,234)	4y., 5m., 27d.	7	475	14·80	18·51
		30	1,758·5	53·30	66·62
Rhoda 2nd's Maud (7,314)	7y., 3m., 18d.	7	411	13·79	17·24
		30	1,600	51·46	64·33
Beulah Clay 3rd (17,034)	2y., 3m., 12d.	7	262·5	10·40	13·00
		30	1,194	41·81	52·27

Record of Dairy Herd—

Name and Breeds of Cows.	Age at beginning of Lactation Period.	Date of Dropping Calf.	Number of days in Lactation Period.	Total pounds of Milk for Period.	Daily average Yield of Milk.	Average per cent Fat in Milk.	Pounds of Butter produced in Period.	Value of Butter at 30c. per pound.
				Lb.	Lb.	p. c.	Lb.	$ c.
Evergreen March 3rd.....H.	3	Apr. 7, 1913..	340	13,817	40·6	3·80	618·21	185 46
Brampton Fresor Tister...J.	4	Nov. 8, 1912..	508	9,567	18·8	5·37	604·65	181 40
Ottawa Kate.....A.	6	Jan. 12, 1913.	395	12,262	31·0	3·90	563·17	168 95
Annie Laurie.....G.A.	6	July 7, 1912 .	427	10,206	23·9	4·08	489·87	146 96
Tannahill's Diamond.....G.H.	5	Oct. 10, 1912	320	12,618	39·4	3·28	487·64	146 29
Maggie Murphy.....G.H.	8	July 9, 1912.	427	13,292	31·1	3·20	500·40	150 12
Jennie Dean.....G.A.	6	July 1, 1912	417	9,252	22·2	4·00	435·64	130 69
Beulah Clay.....H.	7	June 17, 1913.	286	11,472	40·1	3·53	477·06	143 12
Ayrshire's Pearl.....G.	3	Jan. 10, 1912	665	8,120	13·2	5·46	521·93	156 58
Flavia 2nd of Ottawa.....A.	7	Mar. 11, 1913.	327	9,493	29·0	3·94	441·00	132 30
Milkmaid.....G.A.	8	June 16, 1912.	437	8,805	20·1	4·11	426·30	127 89
Rhoda 2nd's Maud.....H.	7	June 4, 1913.	276	10,087	36·6	3·45	410·25	123 08
Dolly.....G.A.	6	July 6, 1912 .	417	7,442	17·8	4·1	386·35	115 91
Canaan Beauty.....H.	5	July 13, 1912.	444	12,154	27·4	3·44	492·28	147 68
Itchen's Pride.....G.	3	Dec. 8, 1911..	517	7,592	14·7	4·91	442·84	132 85
Fanny.....G.H.	3	Apr. 15, 1913..	334	9,780	29·3	3·60	422·58	126 77
Archer's Spot.....G.	2	Oct. 2, 1911..	879	9,806	11·2	4·94	569·95	170 99
Belle K.....G.H.	5	Apr. 12, 1913..	236	9,072	38·4	3·46	369·41	110 82
Belle's Pauline.....G.H.	6	Aug. 10, 1912..	325	9,279	28·6	3·70	404·45	121 34
Ottawa Itchen's Favour.....G.	4	Dec. 6, 1912..	363	6,389	17·6	5·16	387·89	116 37
Queen Bess.....G.H.	6	Oct. 6, 1912.	319	8,776	27·5	3·55	366·80	110 04
Katrina.....G.H.	5	Apr. 19, 1913.	236	8,884	37·6	3·34	349·05	104 72
Brampton Raleigh Cora.....J.	3	Sept.13, 1912.	361	5,951	16·5	5·39	371·72	111 52
Arthur's Rose.....G.H.	6	Sept.15, 1912.	407	9,068	22·3	3·48	371·53	111 46
Centre View Bessie Ann.....H.	4	May 11, 1913.	231	8,576	37·1	3·25	339·91	101 97
Flavia 4th of Ottawa.....A.	3	Sept.29, 1912 .	247	6,485	26·3	4·34	335·41	100 62
Daisy Belle.....G.A.	8	July 6, 1912 .	411	7,653	18·6	3·82	344·14	103 24
Ruby's Pride.....G.	3	Jan. 31, 1913 .	331	5,693	17·0	5·36	359·40	107 82
Itchen's Girl.....G.	3	Aug. 31, 1912 .	382	6,211	16·3	5·02	367·33	110 20
Maggie Pulchrae.....A.	4	May 6, 1913..	285	6,929	24·3	4·26	347·95	104 39
Rose Korndyke.....H.	5	Aug. 16, 1912	532	11,364	21·4	3·44	459·44	137 83
Mainstay Pearl.....G.	2	June 20, 1913.	272	4,400	16·2	5·79	300·05	90 02
Ottawa Deanie.....G.	3	Oct. 10, 1912.	354	5,083	14·4	5·61	335·93	100 78
Betty.....G.A.	7	June 16, 1912.	417	7,761	18·6	3·64	332·41	99 72
Brampton Blue Duchess.....J.	2	Sept.20, 1912 .	375	5,701	15·2	4·93	330·91	99 27
Sonsy 3rd of Ottawa.....A.	4	Oct. 18, 1912.	375	7,421	19·8	3·94	344·70	103 41
Aldyne.....G.H.	8	Feb. 28, 1913 .	365	8,605	23·6	3·81	385·76	115 73
Kirsty 2nd.....G.A.	8	Apr. 30, 1913 .	290	7,715	26·6	3·64	329·85	98 95
Mainstay's Pride.....G.	2	May 10, 1913 .	290	4,975	17·2	5·14	300·82	90 25
Orange Blossom.....F.C.	4	Sept. 1912	273	4,584	16·8	5·32	287·04	86 11
Fortune Cadette.....F.C.	3	Nov.15, 1912	319	5,797	18·2	4·66	318·14	95 44
La Belle.....F.C.	7	May 20, 1912	315	5,764	18·3	4·55	310·30	93 09
Ottawa Kate 2nd.....A.	3	Nov.17, 1912	299	5,056	16·9	4·78	284·64	85 39
Brampton Oakland Trial.....J.	2	Oct. 10, 1912	354	3,870	10·9	6·66	303·37	91 01
Johanna.....G.H.	9	Feb. 10, 1913	234	6,415	27·4	3·34	252·41	75 72
Ottawa Itchen.....G.	7	Sept. 5, 1912.	296	4,269	14·4	5·47	274·79	82 44
Denty 4th of Ottawa.....A.	6	Feb. 22, 1913	341	7,280	21·4	3·91	337·70	101 31
Nancy 2nd.....G.A.	5	Apr. 5, 1913	304	6,864	22·6	3·76	304·04	91 21
Flavia 3rd of Ottawa.....A.	5	Apr. 8, 1913	269	6,258	23·3	4·15	305·91	91 77
Marjorie (imp.).....A.	10	July 22, 1912	267	7,285	27·3	3·47	297·64	89 29
Lady Anne 2nd.....G.A.	6	Apr. 12, 1913	296	6,580	22·2	3·69	285·89	85 77
Marjorie 4th of Ottawa.....A.	4	Oct. 25, 1912	242	5,657	23·4	4·22	281·09	84 33
Bonnie Jean.....G.A.	7	July 10, 1912	412	7,166	16·2	3·28	276·94	83 08
Sargster's Mayflower.....G.H.	6	Sept. 1, 1912	271	5,400	19·9	3·71	236·23	70 87
Dixie 2nd.....G.A.	5	Apr. 12, 1913	254	5,550	21·9	3·87	251·42	75 43
Clothilde Hengerveld Korndyke.H.	2	Sept.17, 1912	338	6,437	19·0	3·46	261·86	78 56
Zaza Lille 2nd.....F.C.	3	Dec. 6, 1912	297	4,588	15·5	4·77	257·76	77 33
Pearly's Maid.....G.	2	Dec.19, 1912	388	4,450	11·5	5·48	287·01	86 10
Duchesse Sauvée.....F.C.	3	Dec.28, 1912	273	3,694	13·5	5·43	236·14	70 84
Inoquette 5th.....F.C.	2	Sept.12, 1912	442	5,284	12·0	4·88	303·88	91 16
Marjorie 6th of Ottawa.....A.	3	Dec.17, 1912	318	5,334	16·8	4·03	253·09	75 93
Marjorie 2nd of Ottawa.....A.	6	Oct. 4, 1912	244	5,547	22·7	3·93	256·17	76 84
Elegante Pauline.....F.C.	2	May 25, 1912	309	4,062	13·2	4·80	229·70	68 91
Denty 3rd of Ottawa.....A.	7	July 20, 1912	288	5,448	18·9	3·92	250·00	75 00
Inoquette 4th.....F.C.	3	Oct. 24, 1912	325	4,977	15·3	4·89	275·05	82 52
Jessie D. of Ottawa.....A.	7	Apr. 7, 1913.	244	4,746	19·5	4·14	231·61	69 48
Jessie E. of Ottawa.....A.	5	Aug. 31, 1912..	303	5,528	18·2	3·95	218·33	65 50

SESSIONAL PAPER No. 16

Central Experimental Farm.

Value of Skim-milk at 20c. per cwt.	Total Value of Product.	Amount of Meal Eaten, at 1½c. per pound.	Amount of Roots and Ensilage Eaten, at $2 per ton.	Amount of Hay Eaten, at $7 per ton.	Amount of Green Feed Eaten, at $3 per ton.	Amount of Straw Eaten, at 20c. per cwt.	Months on Pasture, at $1 per month.	Total Cost of Feed between Calvings.	Cost to Produce 100 pounds Milk.	Cost to Produce 1 pound Butter (skim milk neglected).	Profit on 1 pound Butter (skim milk neglected).	Profit on Cow between Calvings (labour and calf neglected).
$ c.	$ c.	Lb.	Lb.	Lb.	Lb.	Lb.	Mo.	$ c.	Cts.	Cts.	Cts.	$ c.
26 40	211 86	5,066	14,075	2,416	2,450	557	1	91 65	66·3	14·8	15·2	120 21
17 92	199 32	3,741	19,324	3,162	3,620	786	1	85 15	89·0	14·1	15·9	114 17
23 40	192 35	4,275	17,205	2,327	2,450	711	1	84 88	69·2	15·1	14·9	107 47
19 43	166 39	2,443	13,860	2,310	3,040	765	1	59 57	58·4	12·2	17·8	106 82
24 26	170 55	3,063	15,150	1,770	3,640	465	1	66 13	52·4	13·6	16·4	104 42
25 58	175 70	3,313	16,950	2,310	3,040	935	1	73 88	55·6	14·8	15·2	101 82
17 63	148 32	2,607	13,860	2,310	3,040	765	1	61 62	66·6	14·1	15·9	86 70
21 99	165 11	4,241	13,155	2,097	2,450	473	1	79 13	69·0	16·6	13·4	85 98
15 20	171 78	3,344	22,184	2,888	5,710	1,263	1	86 18	106·1	16·5	13·5	85 60
18 10	150 40	3,386	15,265	1,867	2,450	650	1	70 10	73·8	15·9	14·1	80 30
16 76	144 65	2,836	13,860	2,310	3,040	765	1	64 49	73·2	15·1	14·9	80 16
19 35	142 43	3,546	7,415	1,675	2,450	141	1	62 56	62·0	15·3	14·7	79 87
14 11	130 02	1,869	13,860	2,310	3,040	765	1	52 40	70·4	13·6	16·4	77 62
23 32	171 00	4,043	23,701	2,163	6,005	1,011	1	93 84	77·2	19·1	10·9	77 16
14 30	147 15	2,735	19,585	2,513	3,260	1,041	1	70 54	92·9	15·9	14·1	76 61
18 72	145 49	3,338	14,395	1,782	3,040	577	1	69 07	70·6	16·3	13·7	76 42
18 47	189 46	4,632	28,581	4,273	5,710	1,288	1	113 58	115·8	19·9	10·1	75 88
17 41	128 23	2,592	9,315	1,182	3,040	471	1	52 35	57·7	14·2	15·8	75 88
17·75	139 09	3,007	14,395	1,782	3,040	577	1	64 93	70·0	16·1	13·9	74 16
12 00	128 37	2,413	14,955	1,911	2,450	786	1	58 05	90·9	15·0	15·0	70 32
16 82	126 86	2,345	14,950	1,770	3,040	665	1	57 35	65·3	15·6	14·4	69 51
17 07	121 79	2,592	9,315	1,182	3,040	471	1	52 35	58·9	15·0	15·0	69 44
11 16	122 68	2,227	13,392	1,791	2,450	666	1	53 49	89·9	14·4	15·6	69 19
17 40	128 86	2,492	18,140	2,136	3,040	848	1	64 02	70·6	17·2	12·8	64 84
16 47	118 44	2,906	8,685	1,023	2,450	383	1	54 03	63·0	15·9	14·1	64 41
12 30	112 92	2,059	13,675	1,662	1,240	616	1	49 32	76·1	14·7	15·3	63 60
14 62	117 86	2,067	13,860	2,310	3,040	765	1	54 87	71·7	15·9	14·1	62 99
10 67	118 49	2,481	13,455	1,743	2,450	711	1	56 67	99·5	15·8	14·2	61 82
11 69	121 89	2,516	14,439	1,821	3,650	730	1	60 20	96·9	16·4	13·6	61 69
13 16	117 55	2,635	11,575	1,793	2,450	473	1	56 41	81·4	16·2	13·8	61 14
21 81	159 64	4,336	23,925	2,599	6,005	839	1	98 91	87·0	21·5	8·5	60 73
8 20	98 22	1,992	5,010	1,383	2,450	176	1	39 78	90·4	13·3	16·7	58 44
9 49	110 27	2,190	12,647	1,641	2,450	730	1	51 90	102·1	15·5	14·5	58 37
14 86	114 58	2,176	13,860	2,310	3,040	765	1	56 24	72·5	16·9	13·1	58 34
10 74	110 01	2,235	13,792	1,791	2,450	810	1	54 29	95·2	16·4	13·6	55 72
14 15	117 56	2,366	17,295	2,130	3,580	799	1	62 29	83·9	18·1	11·9	55 27
16 44	132 17	3,712	17,085	1,956	3,040	757	1	77 40	89·9	20·1	9·9	54 77
14 77	114 02	3,002	10,205	1,576	3,040	577	1	59 96	77·7	18·1	11·9	54 06
9 35	99 60	2,296	5,800	1,797	2,450	60	1	45 58	91·6	15·2	14·8	54 02
8 59	94 70	1,714	12,746	1,749	.....	610	1	42 51	92·7	14·8	15·2	52 19
10 96	106 40	2,294	13,932	1,821	2,450	730	1	55 11	95·1	17·3	12·7	51 29
10 91	104 00	2,095	15,480	1,813	3,260	697	1	55 30	95·9	17·8	12·2	48 70
9 54	94 93	1,912	12,765	1,359	2,450	726	1	47 55	94·1	16·7	13·3	47 38
7 13	98 14	2,121	12,680	1,541	2,450	730	1	51 07	132·0	16·8	13·2	47 07
12 33	88 05	2,078	9,315	1,186	.....	471	1	41 38	64·5	16·4	13·6	46 67
7 99	90 43	1,767	12,570	1,611	980	657	1	44 08	103·3	16·0	14·0	46 35
13 88	115 19	2,942	18,125	2,233	2,450	801	1	68 99	94·8	20·4	9·6	46 20
13 12	104 33	2,918	10,775	1,596	3,040	577	1	59 55	86·8	19·6	10·4	44 78
11 90	103 67	2,576	15,055	1,867	2,450	634	1	59 73	95·5	19·5	10·5	43 94
13 97	103 26	2,202	18,280	1,818	3,380	780	1	59 80	82·1	20·1	9·9	43 46
12 59	98 36	2,670	10·205	1,596	3.040	577	1	55 88	84·9	19·5	10·5	42 48
10 75	95 08	2,099	16,210	1,782	1,240	678	1	52 90	93·5	18·8	11·2	42 18
13 78	96 86	2,099	14,790	2,496	3,040	858	1	57 04	79·6	20·6	9·4	39 82
10 33	81 20	1,472	13,350	1,550	1,360	665	1	41 48	76·8	17·6	12·4	39 72
10 60	86 03	2,038	9,760	1,428	3,040	563	1	46 92	84·5	18·7	11·3	39 11
12 35	90 91	2,167	12,857	1,771	2,450	610	1	52 04	80·9	19·9	10·1	38 87
8 66	85 99	1,952	12,847	1,641	2,450	730	1	49 13	107·1	19·1	10·9	36 86
8 33	94 43	2,460	14,540	2,022	2,450	711	1	58 46	131·4	20·4	9·6	35 97
6 92	77 76	1,766	10,355	1,275	2,450	655	1	42 88	116·1	18·2	11·8	34 88
9 96	101 12	2,820	16,687	2,539	2,450	666	1	66 83	126·5	22·0	8·0	34 29
10 16	86 09	2,229	14,441	1,377	2,450	801	1	53 40	100·1	21·1	8·9	32 69
10 58	87 52	2,323	16,290	1,782	2,140	657	1	57 09	102·9	22·3	7·7	30 43
7 66	76 57	1,670	13,566	1,582	3,200	597	1	46 96	115·6	20·4	9·6	29 61
10 40	85 40	2,040	17,240	1,644	3,380	636	1	55 84	102·5	22·3	7·7	29 56
9 40	91 92	2,298	15,997	2,007	5,710	730	1	62 77	126·1	22·8	7·2	29 15
9 03	78 51	2,324	10,615	1,208	2,450	557	1	49 68	104·7	21·5	8·5	28 83
10 62	76 12	2,209	15,080	1,818	1,240	701	1	53 32	96·5	24·4	5·6	22 80

Central Experimental Farm.

GRADE AYRSHIRES.

Name of Cow.	Age at beginning of Lactation Period.	Date of Dropping Calf.	Number of days in Lactation Period.	Total pounds of Milk for Period.	Daily average Yield of Milk.	Average per cent Fat in Milk.	Pounds of Butter produced in Period.	Value of Butter at 30c. per pound.
				Lb.	Lb.	p. c.	Lb.	$ c.
Annie Laurie	6	July 7, 1912....	427	10,206	23·9	4·08	489·87	146 96
Jeanie Dean	6	July 1, 1912....	417	9,252	22·2	4·00	435·64	130 69
Milkmaid	8	June 16, 1912....	437	8,805	20·1	4·11	426·30	127 89
Dolly	6	July 6, 1912....	417	7,442	17·8	4·41	386·35	115·91
Daisy Belle	8	July 6, 1912....	411	7,653	18·6	3·82	344·14	103 24
Average	7		422	8,672	20·5	4·08	416·46	124 94

GRADE HOLSTEINS.

Tannahill's Diamond	5	Oct. 10, 1912....	320	12,618	39·4	3·28	487·64	146 29
Maggie Murphy	8	July 9, 1912..	427	13,292	31·1	3·20	500·40	150 12
Fanny	3	Apr. 15, 1913...	334	9,780	29·3	3·60	422·58	126 77
Belle K	5	Apr. 12, 1913....	236	9,072	38·4	3·46	369·41	110 82
Bell's Pauline	6	Aug. 10, 1912....	325	9,279	28·6	3·70	404·45	121 34
Average	5		328	10,808	33·0	3·44	436·90	131·07

AYRSHIRES.

Ottawa Kate	6	Jan. 12, 1913..	395	12,262	31·0	3·90	563·17	168 95
Flavia 2nd of Ottawa	7	Mar. 11, 1913..	327	9,493	29·0	3·94	441·00	132 30
Flavia 4th of Ottawa	3	Sept. 29, 1912.	247	6,485	26·3	4·39	335·41	100 62
Maggie Pulchrae	4	May 6, 1913.	285	6,929	24·3	4·26	347·95	104 39
Soncy 3rd of Ottawa	4	Oct. 18, 1912.	375	7,421	19·8	3·94	344·70	103 41
Average	5		326	8,518	26·1	4·06	406·45	121 93

CANADIANS.

Orange Blossom	4	Sept.—, 1912....	273	4,584	16·8	5·32	287·04	86 11
Fortune Cadette	3	Nov. 15, 1912....	319	5,797	18·2	4·66	318·14	95 44
La Belle	7	May 20, 1912....	315	5,764	18·3	4·55	310·30	93 09
Zaza Fille 2nd	3	Dec. 6, 1912....	297	4,588	15·5	4·77	257·76	77 33
Duchesse Sauvée	3	Dec. 28, 1912....	273	3,694	13·5	5·43	236·14	70 84
Average	4		295	4,885	16·6	4·90	281·88	84 56

GUERNSEYS.

Archer's Pearl	3	Jan. 10, 1912....	615	8,120	13·2	5·46	521·93	156 58
Itchen's Pride	3	Dec. 8, 1911....	517	7,592	14·7	4·91	442·84	132·85
Archer's Spot	2	Oct. 2, 1911....	879	9,806	11·2	4·94	569·95	170 99
Ottawa Itchen's Favour	4	Dec. 6, 1912....	363	6,389	17·6	5·16	387·89	116·37
Ruby's Pride	2	Jan. 31, 1913....	331	5,693	17·0	5·36	359·40	107 82
Average	3		541	7,520	13·9	5·16	456·40	136 92

RECORD of Dairy Herd

GRADE AYRSHIRES.

Value of Skim Milk at 20c. per cwt.	Total Value of Product.	Amount of Meal Eaten, at 1½c. per pound.	Amount of Roots and Ensilage Eaten, at $2 per ton.	Amount of Hay Eaten, at $7 per ton.	Amount of Green Feed Eaten, at $3 per ton.	Amount of Straw Eaten, at 20c. per cwt.	Months on Pasture, at $1 per month.	Total Cost of Feed between Calvings.	Cost to Produce 100 pounds Milk.	Cost to Produce 1 pound Butter (skim milk neglected).	Profit on 1 pound Butter (skim milk neglected).	Profit on Cow between Calvings (labour and calf neglected).
$ c.	$ c.	Lb.	Lb.	Lb.	Lb.	Lb.	Mo.	$ c.	Cts.	Cts.	Cts.	$ c.
19 43	166 39	2,443	13,860	2,310	3,040	765	1	59 57	58·4	12·2	17·8	106 82
17 63	148 32	2,607	13,860	2,310	3,040	765	1	61 62	66·6	14·1	15·9	86 70
16 76	144 65	2,836	13,860	2,310	3,040	765	1	64 49	73·2	15·1	14·9	80 16
14 11	130 02	1,869	13,860	2,310	3,040	765	1	52 40	70·4	13·6	16·4	77 62
14 62	117 86	2,067	13,860	2,310	3,040	765	1	54 87	71·7	15·9	14·1	62 99
16 51	141 45	2,364	13,860	2,310	3,040	765	1	58 59	67·6	14·1	15·9	82 86

GRADE HOLSTEINS.

24 26	170 55	3,063	15,150	1,770	3,040	465	1	66 13	52·4	13·6	16·4	104 42
25 58	175 70	3,313	16,950	2,310	3,040	935	1	73 88	55·6	14·8	15·2	101 82
18 72	145 49	3,338	14,395	1,782	3,040	577	1	69 07	70·6	16·3	13·7	76 42
17 41	128 23	2,592	9,315	1,182	3,040	471	1	52 35	57·7	14·2	15·8	75 83
17 75	139 09	3,007	14,395	1,782	3,040	577	1	64 93	70·0	16·1	13·9	74 16
20 74	151 81	3,063	14,041	1,765	3,040	605	1	65 27	60·4	14·9	15·1	86 54

AYRSHIRES.

23 40	192 35	4,275	17,205	2,327	2,450	711	1	84 88	69·2	15·1	14·9	107 47
18 10	150 40	3,386	15,265	1,867	2,450	650	1	70 10	73·8	15·9	14·1	80 30
12 30	112 92	2,059	13,675	1,662	1,240	616	1	49 32	76·1	14·7	15·3	63 60
13 16	117 55	2,635	11,575	1,793	2,450	473	1	56 41	81·4	16·2	13·8	61 14
14 15	117 56	2,366	17,295	2,130	3,580	799	1	62 29	83·9	18·1	11·9	55 27
16 22	138 15	2,944	15,003	1,956	2,434	650	1	64 60	75·8	15·9	14·1	73 55

CANADIANS.

8 59	94 70	1,714	12,746	1,749	.....	610	1	42 51	92·7	14·8	15·2	52 19
10 96	106 40	2,294	13,932	1,821	2,450	730	1	55 11	95·1	17·3	12·7	51 29
10 91	104 00	2,095	15,480	1,813	3,260	697	1	55 30	95·9	17·8	12·2	48 70
8 66	85 99	1,952	12,847	1,641	2,450	730	1	49 13	107·1	19·1	10·9	36 86
6 92	77 76	1,766	10,355	1,275	2,450	655	1	42 88	116·1	18·2	11·8	34 88
9 21	93 77	1,964	13,072	1,660	2,122	684	1	48 98	100·3	17·4	12·6	44 79

GUERNSEYS.

15 20	171 78	3,344	22,184	2,888	5,710	1,263	1	86 18	106·1	16·5	13·5	85 60
14 30	147 15	2,735	19·585	2,513	3,260	1,041	1	70 54	92·9	15·9	14·1	76 61
18 47	189 46	4,632	28,581	4,273	5,710	1,288	1	113 58	115·8	19·9	10·1	75 88
12 00	128 37	2,413	14,955	1,911	2,450	786	1	58 05	90·9	15·0	15·0	70 32
10 67	118 49	2,481	13,455	1,743	2,450	711	1	56 67	99·5	15·8	14·2	61 82
14 13	151 05	3,121	19,752	2,666	3,916	1,018	1	77 00	102·4	16·9	13·1	74 05

Record of Dairy Herd—

HOLSTEINS.

Name of Cow.	Age at beginning of Lactation Period.	Date of Dropping Calf.	Number of Days in Lactation Period.	Total pounds of Milk for Period.	Daily Average Yield of Milk.	Average per cent Fat in Milk.	Pounds of Butter produced in Period.	Value of Butter at 30c. per Pound.
				Lb.	Ld.	p. c.	Lb.	$
Evergreen March 3rd	3	Apr. 7, 1913	340	13,817	40·6	3·80	618·21	185 46
Beulah Clay	7	June 17, 1913	286	11,472	40·1	3·53	477·06	143 12
Ribsdy 2nd's Maud	7	June 4, 1913	276	10,087	36·6	3·45	410·25	123 08
Canada Beauty	5	July 13, 1912	444	12,154	27·4	3·44	492·28	147 68
Centre View Bessie Ann	4	May 11, 1913	231	8,576	37·1	3·25	339·91	101 97
Average	5		315	11,221	35·6	3·54	467·54	140 26

JERSEYS.

Brampton Fereor Tister—	4	Nov. 8, 1912	508	9,567	18·8	5·37	604·65	181 40
Brampton Raleigh Cora	3	Sept. 13, 1912	361	5,951	16·5	5·30	371·72	111 52
Brampton Blue Duchess	2	Sept. 20, 1912	375	5,701	15·2	4·93	330·91	99 27
Brampton Oakland Trial	2	Oct. 10, 1912	351	3,870	10·9	6·66	303·37	91 01
Average	3		400	6,272	15·7	5·45	402·66	120·80

Central Experimental Farm, Ottawa : A group of dairy cows on pasture ; experimental feeding barn to the left ; horse and sheep barns to the right in background.

Jersey cow, Blue Duchess. Record at 3 years :—5,701 lb. milk, testing 4·93 % fat, or 281·28 lb. fat in 375 days. Owned by Central Experimental Farm, Ottawa.

Central Experimental Farm.—*Continued.*

HOLSTEINS.

Value of Skim Milk at 20c. per cwt.	Total Value of Product.	Amount of Meal eaten, at 1½c. per Pound.	Amount of Roots and Ensilage eaten, at $2 per ton.	Amount of Hay Eaten, at $7 per ton.	Amount of Green Feed Eaten, at $3 per ton.	Amount of Straw Eaten, at 20c. per cwt.	Months on Pasture at $1 per month.	Total cost of Feed between Calvings.	Cost to produce 100 pounds Milk.	Cost to produce 1 pound Butter (Skim Milk neglected).	Profit on 1 pound Butter (Skim Milk neglected).	Profit on Cow between Calvings (Labour and Calf neglected).
$	$	Lb.	Lb.	Lb.	Lb.	Lb.	Mo.	$	Cts.	Cts.	Cts.	$
26 40	211 86	5,066	14,075	2,416	2,450	557	1	91 65	66·3	14·8	15·2	120 21
21 99	165 11	4,241	13,155	2,097	2,450	473	1	79 13	69·0	16·6	13·4	85 98
19 35	142 43	3,546	7,415	1,675	2,450	141	1	62 56	62·0	15·3	14·7	79 87
23·32	171 00	4,043	23,701	2,163	6,005	1,011	1	93 84	77·2	19·1	10·9	77 16
16 47	118 44	2,906	8,685	1,023	2,450	383	1	54 03	63·0	15·9	14·1	64 41
21 51	161 77	3,960	13,406	1,875	3,161	513	1	76 24	67·9	16·3	13·7	85 53

JERSEYS.

17 92	199 32	3,741	19,324	3,162	3,620	786	1	85 15	89·0	14·1	15·9	114 17
11 16	122 68	2,227	13,392	1,791	2,450	666	1	53 49	89·9	14·4	15·6	69 19
10 74	110 01	2,235	13,792	1,791	2,450	810	1	54 29	95·2	16·4	13·6	55 72
7 13	98 14	2,121	12,680	1,641	2,450	730	1	51 07	132·0	16·8	13·2	47 07
11 74	132 54	2,581	14,797	2,096	2,743	748	1	61 00	97·3	15·1	14·9	71 54

CO-OPERATIVE MILK RECORDS.

Although repetition is not as a rule considered advisable yet owing to the increased demand for literature regarding milk and feed record forms, the following is a list of some of these forms, which may be obtained free upon application to this Division. An increasingly large number of dairy farmers have during the past year availed themselves of this offer, which is a gratifying indication of the rapidly advancing methods being adopted by our dairy farmers in the keeping of records for the individual cows of their herds. However, from inquiries, there are apparently a very large number of farmers who, as yet, have not adopted any such records in their herds, nor availed themselves of this offer, being in ignorance of this distribution. The object of this free distribution is not to in any way overlap the work of the Cow Testing Association of the Dairy Branch, Department of Agriculture, Ottawa, but rather to encourage individual farmers in the keeping of dairy records, which individuals in turn will eventually form the nuclei of record centres. The week-long milk record form here illustrated, shows the simplicity and utility of milk record forms for distribution.

The forms for distribution are as follows:—

Month long.—Daily milk records suitable for herds numbering up to twenty-two cows.

Week long.—Daily records for herds of sixteen cows.

Week long.—Daily records for herds of twenty-four cows.

Monthly summary records.

Yearly summary records.

Feed record forms.

OTTAWA.

SESSIONAL PAPER No. 16

DAILY MILK RECORD.

Herd belonging to.. .. ..
Post Office.. .. ..
Record for week ending.. .. ..

This form supplied free by Live Stock Division, Central Experimental Farm, Ottawa, Ont.

Day.	Time.								Total for day.
Sunday.	Morning....								
	Evening...								
Monday.	Morning..								
	Evening.								
Tuesday.	Morning....								
	Evening..								
Wednesday.	Morning....								
	Evening....								
Thursday ..	Morning....								
	Evening....								
Friday	Morning....								
	Evening.								
Saturday.	Morning								
	Evening...								
Total...	Week.								

Remarks:

[Reverse side of Record Form.]

CENTRAL EXPERIMENTAL FARM.

J. H. Grisdale,
Director

E. S. Archibald,
Dominion Animal Husbandman.

Milk Records.

1 The profitable dairy cow must give over 5,000 pounds of milk each year. To know the value of a cow, her total annual yield of milk must be known. The only way to know this is to keep a record of her daily milk yield.

2 The form on the other side of this sheet is intended to help progressive dairy farmers by supplying them with a simple and convenient sheet for the keeping of the milk records of their individual cows. A study of such records will soon indicate which cows should go to the butcher. We should be pleased to receive a summary of your record. If you have no summary forms write us.

3. Such records are being kept by hundreds of successful dairymen to-day. Many of these men attribute their success to the keeping of such records. Why not give the thing a trial if you are a dairyman? It will increase your milk production. It will lighten your labour, since your interest will be increased in your work and "interest lightens labour." It will show you the unprofitable cow, the "boarder." You cannot get rid of her too quickly.

4. For weighing the milk, a simple legal spring balance may be secured for from one and a half to four and a half dollars. If your local dealer cannot supply you, write the undersigned for particulars. A small platform scale is fairly convenient, but we find the spring balance preferable.

5. Many farmers keep records of the amount of food fed to individual cows. If you would like to do so, sample forms would be sent free on writing E. S. Archibald, Dominion Animal Husbandman, Central Experimental Farm, Ottawa, Ont.

16—23½ Ottawa.

DISPOSAL OF MILK.

As previously reported, milk produced on the Central Experimental Farm prior to the year 1911 was largely manufactured into butter, and the skim-milk fed to calves and pigs. Aside from this, a small amount of milk and cream was sold daily to the Farm employees. The manufacture of butter and utilization of the dairy by-products for feeding purposes is continued on about the same scale as in previous years. However, in the year 1911, it was found necessary to look for different methods of disposal of the surplus milk, owing to the necessary increase in the size of the herd, and in consequence experimental work along the lines of cheesemaking was commenced. The following is a list of the methods which were utilized during the past year for the disposal of the milk, and the prices realized on this product, either in its raw or manufactured form.

CREAM CHEESE.

During the past year work was continued in the manufacture of soft cheeses, but owing to a lack of facilities, the manufacture of Canadian Cheddar cheese in an experimental way was discontinued, awaiting the erection of the new dairy building. For full particulars as to the manufacture of cream cheese, a pamphlet has been prepared by this Division, being a slight remodelling of the methods described in the annual report for the year 1911.

These cream cheese are made daily, and are marketed 24 hours after manufacture. Twenty pounds of milk, testing 4½ per cent fat, to which is added four pounds of cream, testing 20 per cent fat, makes fourteen cream cheese, weighing about 6 ounces; hence, by this method of manufacturing, 100 pounds of 4½ per cent milk will make 35 or 36 cheeses. These sell at 15 cents each retail and 11 cents wholesale, or realizing on the milk from $3.80 to $5.40 per hundred pounds. Various methods of manufacturing have been experimented with during the past three years, and even when using a much richer cream, milk testing 4½ per cent butter-fat will still realize over $3 per hundred pounds. The demand for this type of cheese is growing rapidly, and far exceeds the possible output. Many inquiries have come from private individuals regarding the manufacture of this cheese, and it is to be hoped that any such who have ready railway transportation will work up permanent markets in the Canadian towns and cities.

COULOMMIER CHEESE.

This, too, is a very popular type of soft cheese, which requires but little expenditure for equipment and is easily made and ripened. For full particulars as to the manufacture of the same, a special pamphlet describing methods used on the Central Experimental Farm has been written, to which readers are referred, as well as to special bulletins published by the Dairy and Cold Storage Branch of the Department of Agriculture, Ottawa.

One hundred pounds of milk, testing 4½ per cent butter-fat, according to the methods which are being used on the Central Experimental Farm at the present time, will make twenty Coulommier cheese, weighing about 16 ounces each. These are sold on the local market for 15 cents each retail, and 11 cents wholesale; hence 100 pounds of milk, testing 4½ per cent fat, is marketed at from $2.20 to $3 per hundred pounds.

Work similar to the above in the manufacture of the soft cheeses is being started on many of the branch Farms, and it is to be hoped that in a few years a large amount of data regarding these products and the marketing of the same may be available for publication.

OTTAWA.

CERTIFIED MILK.

Investigations along the lines of pure milk production and certified milk production were started during the year 1912. Although considerable valuable data have been collected, this, as yet, is insufficient to give conclusive and detailed results. Owing to the resignation of the bacteriologist, who, with the assistance of the Dominion Botanist, Mr. H. T. Güssow, was conducting the bacterial studies of this milk, such lines of work were discontinued for the latter half of the fiscal year. It is to be hoped, however, that with another appointment this work will be continued immediately.

Certified milk, namely, milk which conforms to a certain standard as to health of the herd, health of the stablemen, and the light, ventilation, sanitation, and cleanliness of the stable, methods of handling milk, and above all the freedom of the milk from bacteria of an injurious nature, shall, according to the Ontario standards, contain not more than 5,000 bacteria per c.c. during the winter months, and 10,000 bacteria per c.c. during the summer months.

A number of private individuals in Canada have from time to time tried the production of this milk, but at present only a few dairy concerns are working on the same.

Many difficulties are met in the keeping down of the bacterial count of the milk in the herd, the stable and in the dairy, as well as the eliminating of the growth of bacteria during delivery. In the overcoming of these difficulties, much valuable information is being gained as to the extra cost of production of the milk and the most advantageous procedures, as well as their feasibility for the Canadian dairyman.

Owing to the lack of a modern and convenient dairy building, with good refrigeration and sanitary conditions for the handling of certified milk, a great deal of difficulty has been met in this work. In consequence of these conditions it has been found advisable to not undertake the bottling of the milk until such time as better facilities warrant. This milk sells to a large local dairy concern for $3 per hundred pounds, in bulk, cooled to 45° F.

BUTTER.

Butter from the Central Experimental Farm usually commands a slightly higher price than the current market figures. During the past fiscal year, for example, it sold at an average of 33½ cents per pound, with a range of 29 to 35 cents. The average milk from the herd tests 4½ per cent butter-fat. In other words, milk sold as butter would realize $1.74 per hundred pounds, not considering the value of the skim-milk. Skim-milk is valued at 20 cents per hundred pounds when fed to calves and pigs. When fed with discretion, this is the minimum valuation; it often reaching a value of 75 cents or more per hundred pounds when fed to young calves and newly-weaned pigs.

DAIRY BARN PLANS.

During the fiscal year ending March 31, 1914, a large number of completed plans, with specifications, for dairy barns to suit local conditions and individual needs of farmers have been distributed free. Although this entails a large amount of work, yet the many inquiries as to the details of modern dairy barn plans are increasing in numbers from all parts of Canada and, considering the most undesirable state of the average Canadian barn, it is felt that such work demands immediate attention; hence the farmers who anticipate the construction of new barns or the remodelling of their old barns, have been encouraged to write for free information to the Division of Animal Husbandry, Central Experimental Farm, Ottawa.

This Division has also supplied complete sets of plans and specifications for two of the new Farms of the Experimental Farm system. These plans and specifications,

prepared by the Dominion Animal Husbandman under the supervision of the Director of Experimental Farms, are as follows:—

For the Experimental Station, Fredericton, N.B., one large dairy barn, one main storage barn with housing accommodations for dairy heifers and beef breeding and feeding animals, one horse barn, and one model farm dairy with the refrigeration building attached.

For the Experimental Station, Ste. Anne de la Pocatière, Que., one large dairy barn and one horse barn.

For further details regarding these buildings see reports of these Stations.

The plans of the barns recently destroyed by fire on the Central Experimental Farm have also been prepared by this Division under the supervision of the Director of Experimental Farms, and the work also conducted under the supervision of this Division. It is to be hoped that these buildings will be completed on or before August 15, 1914. Full details as to the same will appear in the annual report for the fiscal year ending March 31, 1915. However, details as to the structure of the same are at any time available to any one inquiring.

OTTAWA.

FINANCIAL STATEMENT FOR DAIRY CATTLE.

Below are submitted inventories and returns from dairy cattle on the Central Experimental Farm during the year April 1, 1913, to March 31, 1914.

	April 1, 1913.		March, 31 1914.		Returns including sales of dairy produce, breeding cattle, and bull service.	Gross returns made up of increase in value of products and value of animals sold.
	No.	Value.	No.	Value.		
		$		$	$	$
Dairy cattle.....	138	22,289 00	140	24,275 00	16,596 02	18,582 02

Returns.

By increased value of herds	$ 1,986 00	
Returns from dairy products	11,157 02	
Returns from sales of dairy breeding cattle....	4,300 00	
Returns from bull service	59 00	
Returns from manure, 980 tons at $1 per ton...	980 00	
Gross returns		$18,482 02

Expenditures.

To value of food stuffs consumed.....	$7,014 00	
Cost of labour	3,090 00	
Cost of new stock purchased	1,680 00	
Gross expenditures		11,784 00
**Net balance from dairy cattle		$6,698 02**

OTTAWA.

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

A dairy barn is in prospect and land suitable for pasture and forage crops is likely to be acquired in the near future.

The dairy live stock work is limited at this Station to one grade dairy cow, which is kept as a milk supply to the Farm houses.

DAIRY COW.

The cow calved June 2. She was out on pasture for five and one-half months. The following data were recorded:—

Number of days milking	days	278
Number of pounds of milk	lb.	7,881
Amount of hay fed, counted for one year	"	1,858
Amount of oats fed, counted for one year	"	1,871
Amount of bran fed, counted for one year	"	2,717
Amount of roots fed, counted for one year	"	10,315
Pasture, 5½ months at $1 per month	$	5 50
Cost of feed	"	80 71
Value of milk, 3,152·4 quarts at 5 cents per quart	"	157 62
Balance	"	76 91

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

DAIRY CATTLE GRADING EXPERIMENT.

OBJECT OF EXPERIMENT.

The object of this experiment is to discover the actual cash value of the pure-bred dairy sire, in a herd of common and mixed breeding, in the increased production of the progeny, as well as their proportionately greater market value. The outline of this experiment was reported in the annual report for the year ending March 31, 1913.

RESULTS OF EXPERIMENT TO DATE, APRIL 1, 1914.

The twelve heifers termed the "foundation heifers" have dropped their first lot of calves from the Ayrshire cross, Holstein cross, and Guernsey cross, and have completed their first two lactation periods.

The first crop of calves (first cross Ayrshire), calved in the fall of 1911, yielded eight heifers, which in turn have dropped their first crop (second cross Ayrshire), calved in the fall of 1913, yielding five heifers. These in turn are to be bred to a pure-bred Ayrshire bull to calve in the fall of 1915.

The second crop of calves from the foundation cows (first cross Holstein), calved in the fall of 1912, yielded six heifers. These are being bred to a pure-bred Holstein bull to calve in the fall of 1914.

The third crop of calves (first cross Guernsey), calved in the fall of 1913, yielded three heifers, which are being fitted to be bred to calve in the fall of 1915.

The greater percentage of progeny are promising to be superior to their dams and, as would naturally be expected, a few only are not.

Unfortunately two of the foundation heifers have not been successful in passing the yearly test and have been disposed of. These are Jessie and Spot, both of which have heifers to succeed them.

The following table will give the results of the second year's work in milk production:—

RECORD of Dairy Herd—

Name of cow.	Date of dropping calf.	Number of days in lactation period.	Total pounds of milk for period.	Daily average yield of milk.	Average per cent fat in milk.	Pounds of butter produced in period.
			lb.	lb.	p. c.	lb.
Maggie	Dec. 15, 1912	365	8,202·4	22·47	4·5	434·23
Vera	" 27, 1912	317	7,978·8	25·17	3·7	347·31
Mossy	" 6, 1912	332	4,798·2	14·45	5·3	299·18
Jean	Mar. 8, 1913	270	6,480·1	24·00	3·9	297·32
Spot	Jan. 14, 1913	335	5,630·8	16·8	4·3	284·85
Jessie	Dec. 19, 1912	353	6,221·3	17·62	3·9	285·45
Bell	Jan. 24, 1913	299	6,057·0	20·25	3·9	277·90
Queen	Dec. 21, 1912	307	5,005·1	16·30	4·0	235·53
Ella	Jan. 12, 1913	261	4,914·1	18·82	4·0	231·25
Myrtle	Feb. 1, 1913	261	3,628·5	13·90	3·9	165·48
Georgie	" 2, 1913	261	3,411·7	13·07	4·1	164·56
Average 11 head		305	5,666·2	18·58	4·1	274·91

SESSIONAL PAPER No. 16

Nappan Experimental Farm.

Value of butter at 30 cts. per pound.	Value of skim-milk at 20 cts. per cwt.	Total value of product.	Amount of meal eaten, at 1¼ cts. per pound.	Amount of roots and ensilage eaten at $2 per ton.	Amount of hay eaten at $7 per ton.	Amount of green feed eaten, at $3 per ton.	Months on pasture, at $1 per month.	Total cost of feed for period.	Cost to produce 100 pounds of milk.	Cost to produce 1 pound of butter, skim-milk neglected.	Profit on 1 pound of butter, skim-milk neglected.	Profit on cow during period, labour and calf neglected.
$ c.	$ c.	$ c.	lb.	lb.	lb.	lb.	Mo.	$ c.	cts.	cts.	cts.	$ c.
130 27	15 54	145 81	2,545	13,050	3,855	1,830	4	65 10	79·4	14·99	15·01	80 71
104 19	15·26	119 45	2,407	13,050	3,855	1,830	4	63 37	79·4	18·24	11·76	56 08
89 75	9 00	98 75	1,810	13,050	3,855	1,830	4	55 91	116·5	18·69	11·31	42 84
89 20	12·37	101 57	2,375	13,050	3,855	1,830	4	62 97	97·2	21·17	8·83	38 60
85 46	10 69	96 15	1,991	13,050	3,855	1,830	4	58 17	103·3	20 42	9·58	37 98
85 64	11 87	97 51	2,128	13,050	3,855	1,830	4	59 89	96·3	20·98	9·02	37·62
83 37	11 56	94 93	2,031	13,050	3,855	1,830	4	58 67	96·9	21·11	8·89	36·26
70 66	9 54	80 20	1,729	13,050	3,855	1,830	4	54 89	109·7	23·30	6·70	25·31
69 38	9·36	78 74	1,734	13,050	3,855	1,830	4	54 96	111 8	23·77	6·23	23 78
49 94	6 93	56 87	1,257	13,050	3,855	1,830	4	49 00	135·0	29·43	·57	7·87
49 37	6 49	55 86	1,224	13,050	3,855	1,830	4	48·58	142·4	29·52	·48	7 28
82 47	10 78	93 25	1,930	13,050	3,855	1,830	4	57 41	101·3	20·52	9·48	35 84

DATA re Cost of Holstein Heifers from Birth until 1 year old

Name	Period.	Whole Milk.	Skim-milk.	Meal	Roots or Ensil-age.	Hay	Green Feed.	Mol-asses.	Total Cost.
		Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	$ cts
Myrtle 1 H	Feb. 1, 1913, to Feb. 1, 1914	420	2,260	692½	5,660	1,827	1,220	112	32 56
Bell 1 H	Jan. 24, 1913, to Jan. 24, 1914	424	2,400	671½	5,380	1,757	1,220	112	32 09
Spot 1 H	Jan. 14, 1913, to Jan. 14, 1914	420	2,320	644	5,036	1,678	1,220	112	30 93
Vera 1 H	Dec. 27, 1912, to Dec. 27, 1913	420	2,080	625¼	4,388	1,509	1,220	112	28 98
Jessie 1 H	Dec. 19, 1912, to Dec. 19, 1913.	560	2,080	571¼	4,068	1,429	1,200	112	28 93
Mossy 1 H	Dec. 6, 1912, to Dec. 6, 1913	560	2,340	539	4,248	1,299	1,200	106	28 69

DATA re Cost of Ayrshire Heifers from the time they are Yearlings until they drop their first calves.

Name	Period.	Hay.	Roots and Ensilage.	Meal.	Pasture Months.	Total Cost.
		Lb.	Lb.	Lb.		$ cts.
Lessie 1 A	Nov. 25, 1912, to Jan. 7, 1914	3,475	10,900	1,069	4½	41 76
Jessie 1 A	" 18, 1912, to Nov. 19, 1913.	2,800	9,120	872	4½	34 76
Spot 1 A	Dec. 4, 1912, to Jan. 10, 1914.	3,255	9,970	1,029	4½	39 24
Mossy 1 A	" 28, 1912, to Dec. 26, 1913.	2,790	8,650	882	4½	34 38
Myrtle 1 A	" 24, 1912, to Nov. 17, 1913	2,410	7,650	754	4½	30 38
Queen 1 A	" 21, 1912, to Dec. 12, 1913.	2,650	8,300	833	4½	32 90
Ella 1 A	Feb. 1, 1913, to Feb. 24, 1914.	3,055	8,920	982	4½	27 88
Jean 1 A	Mar. 7, 1913, to Feb. 24, 1914.	2,715	7,560	873	4½	32 91

EXPERIMENTAL STATION, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT, W. S. BLAIR.

DAIRY CATTLE.

During the summer of 1913, the only head of dairy cattle at this Station was one grade cow. During the month of October, 1913, an importation was made from Ontario of eleven Shorthorn cows and one Shorthorn bull. These cows are all of Scotch foundation blood and were picked out as representing a good type of farmers' Shorthorn, showing indications of fair milk production over and above the requirements of their calves. These are not dairy Shorthorns as to breeding, but will be treated in the herd as pure-bred farmers' cows, from the dairy standpoint. A Shorthorn bull from good milking strain was purchased to head this herd, and the purpose of the herd is the development of a thick, strong beef type of Shorthorn which will give at least a reasonable flow of milk—sufficient to warrant profitable milking of such.

From the time when the Shorthorn cows arrived at this Farm until the end of the fiscal year, five head freshened, giving four heifer calves and one bull calf. All these cows are milking fairly well, and their calves are most promising. The practice of taking the calf from the cow on the third day has been followed. Two of the cows, apparently used to suckling their calves, objected most strenuously, but these have gradually become more accustomed to hand-milking, and in another year give promise of a good milk record. As no cow has finished a lactation period, reports of production from this herd will not be given until the annual report for the fiscal year 1914-15.

FEEDING THE DAIRY COW.

The cows were fed on a meal ration of 1 pound to each 3 pounds of milk produced. The meal ration consisted of 400 pounds bran, 100 pounds cottonseed meal, 200 pounds crushed oats, 100 pounds linseed meal, and 100 pounds cornmeal, mixed together. The succulent feed consisted of 40 pounds ensilage or turnips, and 12 pounds hay each per day.

They were given a light feed of hay early in the morning, followed by the ensilage or roots, on which half the daily meal ration was scattered; this was followed by another light feed of hay. This was all eaten by ten o'clock and the next feed was given about three o'clock. The afternoon feed consisted of, first, ensilage or roots, and the other half of the daily meal ration and half the daily hay ration to finish up. Drinking bowls were alongside the cows so that they could get water when needed.

EXPERIMENTAL STATION, FREDERICTON, N.B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

DAIRY CATTLE.

No dairy work was done during the year. Two cows were purchased in May and their milk sold to the various families belonging to the officers and men connected with the Station. These two cows produced approximately 15,000 pounds of milk.

In the absence of equipment no record was kept of the cost of feeding.

Next year it is intended to have about thirty-five milch cows on the Farm; part of them will be pure-bred Shorthorns, Ayrshires, and Holsteins, and eighteen cows of no particular breeding will be kept under records. These latter will be served by a Holstein bull with the object of testing out heifers for comparison with the records of their dams.

COW BARNS.

The accompanying plans and photographs of the new cow barns erected in the summer of 1913 at the Experimental Station, Fredericton, N. B., are for the most part self-explanatory. A few additional remarks, however, may help to make some points more intelligible. For more complete specifications, special reference is made to the report of the Dominion Animal Husbandman for the year ending March 31, 1913, in which complete plans and specifications of a new dairy barn at Ottawa are detailed. The details of the Fredericton barn, particularly of the dairy cattle wing, are largely similar to the Ottawa structure.

FOUNDATION.

All foundations are of concrete, well reinforced and extending 3 feet above the floor level of barns, on which are bolted the sills.

SUPERSTRUCTURE.

The superstructure of both of these barns is of wood, hip roofed, plank framed, and the roof covered with best quality galvanized metal shingles. The framing throughout this barn is of timbers made from plank of the dimensions 2 by 6 inches, 2 by 8 inches, and 2 by 10 inches.

The covering of the frame, the method of flooring, ceiling, insulating the walls, and the like, are similar to those described under the horse barn, and also other specifications as found in the annual report of Superintendents in other chapters of this volume.

DIMENSIONS.

The main barn is 100 feet long by 50 feet wide, outside dimensions. The ceiling of the stable is 10 feet in height, and the post in the storage barn above is 15 feet in height. Underneath the driveway is the root cellar, capable of holding approximately 5,000 bushels. A silo, conveniently situated, opens into feed room.

The dairy cattle barn is a wing to the main barn, the same being 101 feet 3 inches long by 41 feet 2 inches wide, with milk room and wash room underneath driveway to storage barn above.

The main barn accommodates beef breeding cows, steers, bulls, and all calves, together with the feed room and hospital, while the dairy barn wing accommodates forty-eight head of milch cows or dairy heifers.

Details as to dimensions of stalls, together with the cement finish, levels, slopes, etc., may be found in the brief specifications as contained in the reports for the superintendents of other Farms, and also in the report of the Dominion Animal Husbandman for the year ending March 31, 1913.

Particular attention is drawn to the different types of mangers experimented with. In the dairy barn the raised front manger is illustrated, while in the beef or main barn, the continuous mangers with the raised feed passage, and also with the submerged feed passage, but with only 10-inch curbing front manger, are illustrated.

LIGHT.

As much light as the strength of the walls would permit was installed in this barn. The barn is lighted by 768 square feet of glass, or at the rate of 15·8 square feet per head. The direct sunlight thus reaches every part of the barn, which renders it most sanitary, bright and cheerful.

VENTILATION.

The modified Rutherford system of ventilation is used in this barn, the details of which have been so thoroughly described elsewhere. The area of intake ducts per head is about 13 square inches, and the area of the foul air outlets per head is about 26 square inches. Aside from this, the windows of the barn can be so operated that they may be tilted inwards from the top, thus facilitating ventilation in weather so warm that the ventilation system is insufficient.

The ventilation of the root cellar is on the same principle as that of the barn, and seems to work quite satisfactorily. Especial care must be taken, however, in the ventilation of any root cellar, that the ventilators be closed immediately after the roots are thoroughly cooled and dried, in order that frost be not allowed into the roots.

ACCOMMODATION.

As will be seen from the plans, the dairy barn accommodates forty-eight head of cattle, while the main or beef barn will accommodate twenty-one head tied in stanchions, thirty calves, three bulls, and three box stalls which will accommodate either five steers or six heifers each, as well as the maternity hospital.

Complete accommodations in milk rooms, wash room, feed room with meal room above, root cellars, silo, litter carriers throughout the barn, etc., may be seen by a close examination of the plans and illustrations.

FREDERICTON.

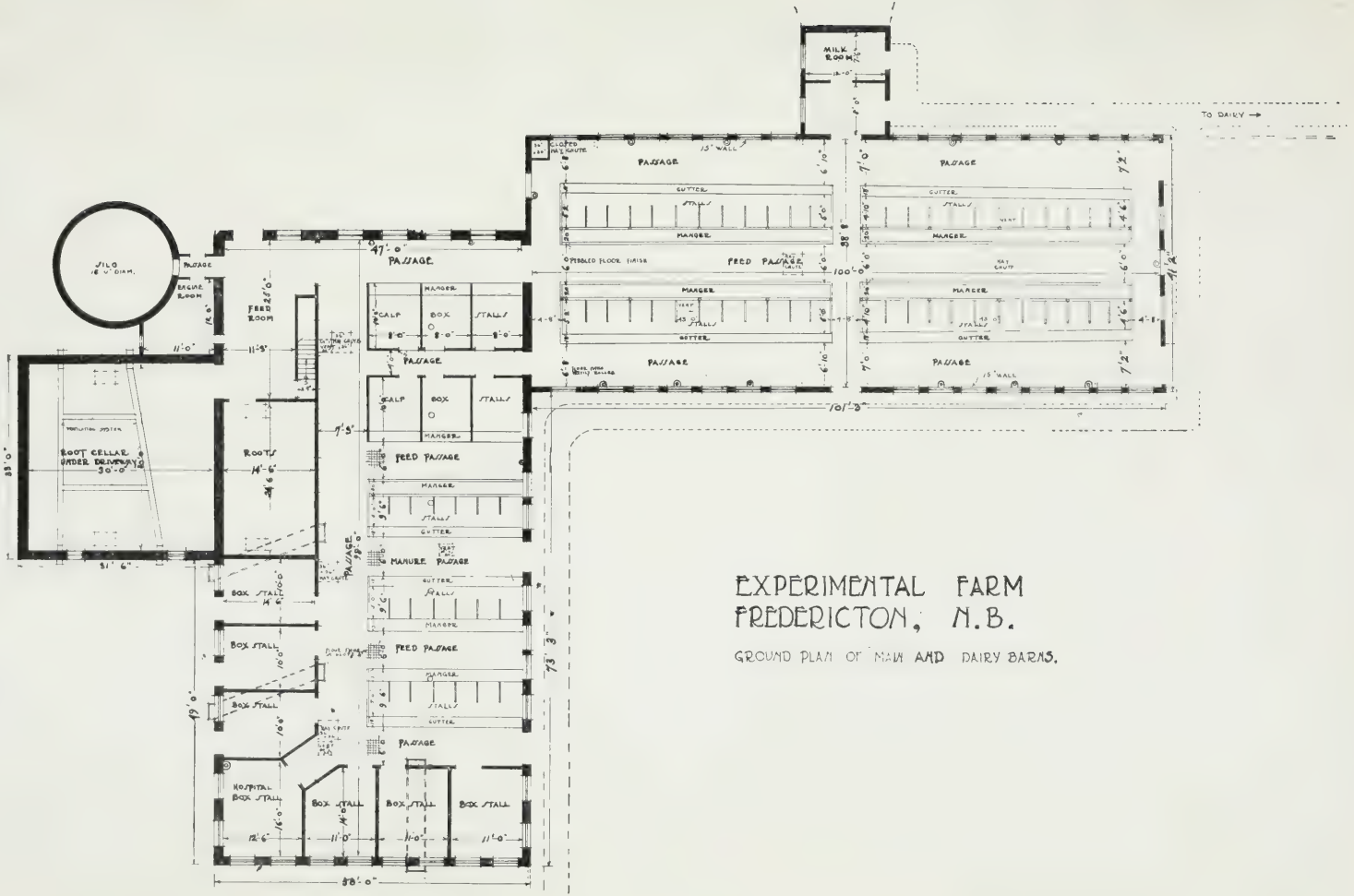
WATER.

Individual water basins are provided for all tie stalls, and convenient taps arranged for the watering of calves and all individuals maintained in box stalls.

PLANS AND SPECIFICATIONS.

More complete plans and specifications of this barn, or any part of same, will be forwarded to parties interested, upon application to the Superintendent, Experimental Station, Fredericton, N.B.

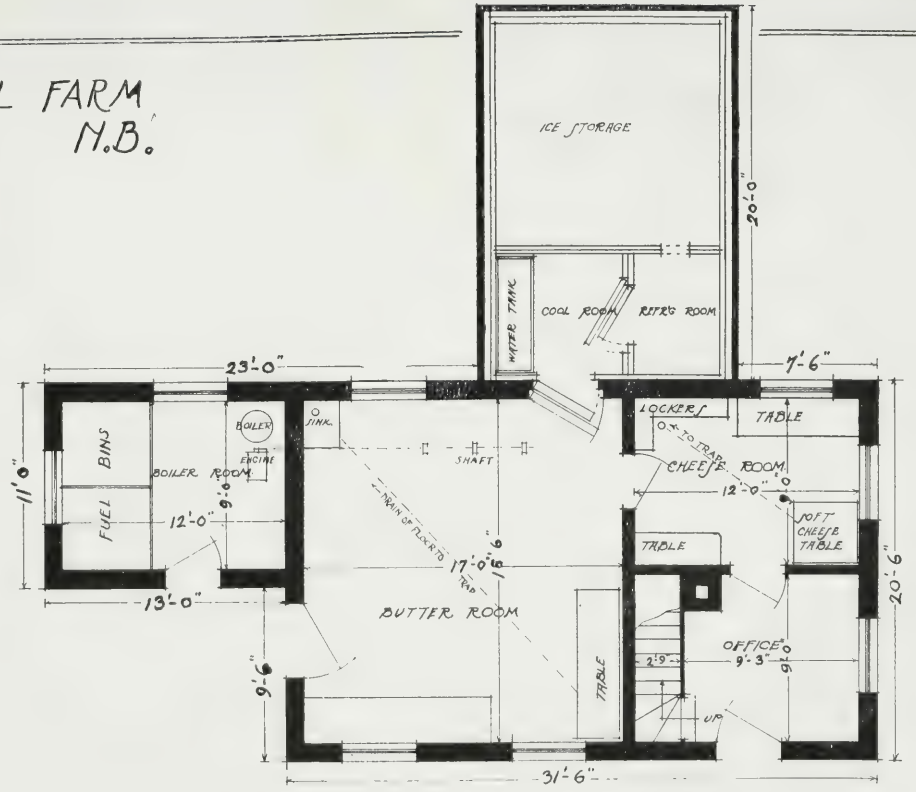
16—1915—v. 368.



EXPERIMENTAL FARM
FREDERICTON, N.B.

GROUND PLAN OF MAIN AND DAIRY BARNS.

EXPERIMENTAL FARM FREDERICTON, N.B.



DAIRY BUILDING
GROUND FLOOR PLAN
SCALE 1/4" PER FOOT

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. A. LANGELIER.

DAIRY CATTLE.

The herd now comprises fifty-three head of pure-bred and grade French Canadians. There are one aged and three yearling bulls, twenty-seven cows, nine yearling heifers, and thirteen calves, ranging from a few days to ten months of age. Out of this number there are sixteen grade cows and heifers. These grades are kept to show that, with a good pure-bred bull, a fairly uniform and a paying herd can be bred. It is remarkable to note how the first point has already been reached, as there are six grade heifers which appear to be pure-breds. Time alone, of course, will tell whether they will be as profitable at the pail as their more aristocratic registered sisters, but it is difficult to see why this would not be the case.

The following table gives detailed results for cows which finished a lactation period during the year:—

Names of cows.	Registration No.	Age at beginning of lactation period.	Date of dropping Calf.	Number of days in lactation period.	Total pounds of milk for period.	Daily average yield of milk.	Average per cent fat in milk.	Pounds of butter produced in period.
					lb.	lb.	p.c.	lb.
Gipsy	G.F.C.	5½	Sept. 11, 1912.	465	11,928·09	25·65	4·0	561·86
Finette 2	218	8	Mar. 4, 1913.	341	8,089·25	23·57	4·0	398·21
Jeannette de St. Denis	2,409	7	April 27, 1912.	337	6,453·00	19·15	4·71	357·34
Flora	G.F.C.	13	Mar. 25, 1912.	339	6,852·75	20·21	4·66	375·42
Empire	2,398	1¼	May 29, 1912.	426	5,706·25	13·39	4·59	307·57
Delphine	G.F.C.	6	May 26, 1912.	461	6,988·50	15·16	4·4	338·94
Amanda	G.F.C.	7	" 4, 1912,	311	5,677·75	18·26	4·35	288·23
Bella	G.F.C.	10	May 6, 1912.	329	5,673·00	17·24	4·49	299·62
La Brune du Sable	2,440	8	April 20, 1912.	403	4,902·00	12·40	4·78	275·97
Exilée de Kamouraska	2,414	2	" 5, 1912.	402	4,453·25	11·08	5·07	265·36
Princesse du Sable	2,261	2½	Dec. 5, 1912.	271	4,345·25	16·03	4·63	236·70
Christine	G.F.C.	6	May 25, 1912.	285	4,350·50	15·34	4·63	233·45
Eva	G.F.C.	8	Mar. 25, 1912.	257	4,360·50	16·97	4·28	219·69
Hilda	G.F.C.	9	April 26, 1913.	243	4,004·00	12·33	4·57	215·57
Simone	2,259	8	June 13, 1912.	271	4,153·75	15·33	4·64	226·57
Kate	G.F.C.	6	April 6, 1912.	316	4,201·00	13·29	4·59	226·67
Frisée	1,612	6	April 27, 1912.	352	3,643·75	10·35	4·95	210·88
Denise Besse	1,269	7⅓	Dec. 18, 1912.	292	3,372·00	11·50	4·5	184·65

Value of butter at 28 cts. per lb.	Value of skim milk at 20 cts. per cwt.	Total value of product.	Amount of meal eaten, at 1¼ cts. per lb.	Amount of roots and ensilage eaten, at $2 per ton.	Amount of hay eaten, at $7 per ton.	Amount of green feed eaten, at $3 per ton.	Months on pasture, at $1 per month.	Total cost of feed per period.	Cost to produce 100 lbs. of milk.	Cost to produce 1 lb. of butter, skim milk neglected.	Profit on 1 lb. of butter, skim milk neglected.	Profit on cow during period, labour neglected.
$ cts.	$ cts.	$ cts.	lb.	lb.	lb.	lb.	Mo.	$ cts.	cts.	cts.	cts.	$ cts.
157·31	22 90	180 21	3,073·8	5,624·5	2,439·5	12,689·5	1½	73·11	61·3	13·0	15·0	107 10
111 50	15 40	126 91	2,267·8	5·726·0	2,247·0	7,290·0	1½	54·39	67·0	11·1	16·9	72 52
100 05	12 30	112 35	1,761·8	4,270·4	1,802·5	6,878·0	1½	44·43	68·8	12·7	15·3	67·92
105 12	13 07	118 19	1,907·8	6,159·5	2,695·0	8,830·0	1½	54 18	70·3	14·4	13·6	64 01
86·12	10 89	97 01	1,741·3	4·077·5	1,911·0	6,352·0	3	45 06	78·7	14·0	14·0	51·95
94 90	13 40	108 30	2,081·5	5,280·0	2,432·0	9,300·0	3	56 76	81·2	16·7	11·3	51·54
80·70	10·86	91 56	1,590·1	3,527·5	1,641·0	6,878·0	1½	40·96	72·0	14·2	13·8	50·80
83·89	10 83	94 92	1,733·2	5,310·0	2,430·0	8,100·0	1½	49·13	86·6	16·4	11·6	45·59
77 27	9 33	86 60	1,479·6	4,228·0	2,032·0	6,480·0	1½	41 04	83·7	14·8	13·2	45 56
74 30	8 46	82 76	1,479·5	4,260·0	1,860·0	4,760·0	1½	37 90	85·1	14·2	13·8	44 86
66 28	8 29	74 57	1,363·7	3,749·8	1,657·5	4,212·0	1½	34 46	79·2	14·5	13·5	40·11
65 37	8 30	73 67	1,324·1	3,251·1	1,470·5	6,878·0	1½	36 77	84·5	15·7	12·3	36 90
61 51	8 35	69 86	1,242·9	2,992·5	1,215·0	7,290·0	1½	35·22	80·7	16·3	11·7	34 64
60 36	7 64	68 00	1,170·5	2,495·5	1,021·0	7,689·0	1½	33·73	84·2	15·5	12·5	34 27
63 44	7 92	71 36	1,302·8	3,676·1	1,640·5	6,878·0	1½	37 52	90·3	16·5	11·5	33·84
63 47	8 01	71 48	1,285·8	3,570·0	1,629·0	7,290·0	1½	37 78	89·9	16·6	11·4	33·70
59 05	6 93	65 97	1,116·0	3,909·7	1,734·0	6,878·0	1½	35 74	98·0	16·9	11·1	30 23
51 70	6 43	58 13	989·0	3,982·5	1,813·0	6,483·0	1½	33 91	100·5	18·5	9·5	24 22

One thing stands out very plainly from the above table; that the biggest profit-making cows are in general the largest producers, which consume the most feed at the highest cost. There are, of course, exceptions, but here again is shown the fact that good cows, well fed, are the only ones which pay. This is so often repeated that it seems useless to mention the matter here, but it is wonderful that so few farmers will, in this case, put into practice what is acknowledged by all to be the best procedure to follow. Culling and feeding, more than breeding, is the shortest road to success. Why it seems to a large number the hardest to follow is beyond comprehension.

FEEDING EXPERIMENT WITH DAIRY CATTLE.

The question of concentrates is becoming an important one now that mill by-products cost so much, and with the price of milk not advancing very much. A feeding experiment was thus planned in which nine cows, whose weights did not differ enough to materially change the result, were fed exactly the same quantities

DAIRY RECORDS.—

Name of Cow.	Registration No.	Age at beginning of test.	Produced during previous lactation Period.			Date of calving.	Days in feeding test.
			Milk.	Fat.	Milk per day.		
			lb.	lb.	lb.		
LOT I.—Amanda	G.F.C.	7	5,677·75	288·23	18·26	June 8, 1913	128
Christine[1]	G.F.C.	6	4,350·5	233·45	15·34	" 27, "	"
Hilda	G.F.C.	9	4,004.00	215·57	12·33	" 18, "	"
LOT II.—Bella	G.F.C.	10	5,673·00	299·62	17·24	July 22, "	"
Eva	G.F.C.	8	4,560·5	219·69	16·97	June 12, "	"
Flora	G.F.C.	13	6,852·75	375·42	20·21	" 25, "	"
LOT III.—La Brune du Sable	2,440	8	4,902·00	275·97	12·40	July 18, "	"
Jeannette de St. Denis	2,409	7	6,453·00	357·34	19·15	June 24, "	"
Simonne	2,259	8	4,153·75	226·57	15·33	" 29, "	"

[1]Ceased giving milk before end of experiment. Roughages charged to her only when milking.

of roughages, whilst three received 1 pound of concentrates for 8 pounds of milk, three others 1 pound of concentrates for 4 pounds of milk, and the last three all the concentrates they would eat, which was 1 pound per 2·25 pounds of milk.

The following table gives details about previous records of cows, their feed, production and profit:—

Cap Rouge, Que.

Amount of meal eaten, at 1¼ cts. per lb.	Amount of roots and ensilage eaten, at $2 per ton.	Amount of hay eaten, at $7 per ton.	Total cost of feed for period.	Total pounds of milk for period.	Pounds of butter produced in period.	Value of butter, at 28 cts. per lb.	Value of skim milk, at 20 cts. per cwt.	Total value of product.	Profit on cow during period, labour neglected.	Profit on each group during period, labour neglected.	Gain in weight for each group during period.	Pounds of milk for one lb. of meal.
lb	lb.	lb.	$ cts.	lb.	lb.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	lb.	lb.
194·11	5,534·00	1,024·00	11 54	1,553·88	74·49	20 85	2 98	23 83	12 29			
118·88	4,874·00	920 00	9·58	951·04	46·42	11 45	1 82	13 27	3 69	9·26	38	8
223·23	5,534·00	1,024·00	11·80	1·786·49	72·26	20 23	3·45	23·68	11·78			
480·61	5,534·00	1,024·00	15 12	1,903·19	82·26	23 03	3 67	27 30	12 18			
425·67	5,534·00	1,024·00	14·43	1,702·68	72·83	20 33	3 28	23 66	9 23	10 67	11	4
397·51	5·534·00	1,024·00	14 08	1,590·04	77·26	21 63	3 05	24 68	10 60			
1,024.00	5,534·00	1,024·00	21 91	2,446·26	119·97	33 59	4·69	38 28	16 37			
1,193.00	5,534·00	1,024 00	21 02	2,617 50	129·67	36 31	5 01	41 32	17·30	15 50	17	2·25
1,024.00	5,534·00	1,024·00	21 91	2,220·25	112·47	30 49	4·25	34 74	12 83			

Here again is demonstrated the importance of "feed and weed." Taking the average for each group, we find that the three cows which received 1 pound of meal for 2·25 pounds of milk gave, during the period of the experiment, an average profit of $15.50 each, the three which received 1 pound of meal per 4 pounds of milk gave an average profit of $10.67, whilst the three which received 1 pound of meal per 8 pounds of milk only gave an average profit of $9.26. These profits look small for the length of the feeding experiment, 128 days, but it must not be forgotten that this test commenced when, on an average, each of the nine cows had already been milking 137 days. Most of these cows are served to calve during August, 1914, to gather more data on the subject, and it is proposed to commence the feeding test soon after they calve. A small paddock, practically bare, will be used to give them exercise, and green feed will be fed in the stable after being weighed.

As to the question of weeding out the "boarders," a few figures given here will show that it is an important one. It shows one other point: besides knowing what the cow produces, a farmer must also have an idea of what she eats, as a good producer may not make an economical use of her feed. No doubt many will say that it is too much trouble to do all this weighing, but the farmer is in business as the manufacturer, the merchant and the contractor, and if he is to make a success of this business, he must know what it costs him to produce the goods which he sells. It is reasonably safe to say that when a majority of farmers get to know how much it costs them to produce milk, they will then commence to make larger profits, as they will discard the non-paying cows and perhaps also insist on getting more for their milk. Both these things must be done before the dairying industry pays the dividends which it should for the money invested therein.

Economical and Non-economical Producers compared.

Name of cows.	Ratio of meal fed per lb. of milk.	Cost of feed.	Value of product.	Gain in weight.	Value of this gain at 7c per pound.	Profit over feed.	Profit including gain in weight.
		$ cts	$ cts.	Lb.	$ cts.	$ cts.	$ cts.
Amanda	1-8	11 54	23 83	30	2 10	12 29	14 39
Bella	1-4	15 12	27 30	15	1 05	12 18	11 13
Simonne	1-2·25	21 91	34 74	25	1·75	12 83	14 58

It is easily seen here that Amanda, which received only 1 pound of meal per 8 pounds of milk, and which gave a profit of $14.39, made better use of her feed than Simonne, which received 1 pound of meal per 2·25 pounds of milk and only gave a profit of $14.58. There is no positive proof that Amanda would have given a larger profit had she received more meal, but the averages, on the large table above, would tend to show to any fair-minded person that she would. What the dairyman wants is more Amandas and less Simonnes. To keep the first and get rid of the second, there is nothing else to do but weigh the milk and keep a record of the concentrates given, increasing the amount until it is found that the cow does not respond with a profitable increase.

Cap Rouge.

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIÈRE, QUE.

REPORT OF THE SUPERINTENDENT, JOS. BEGIN.

DAIRY CATTLE.

A small but excellent start was made in a dairy herd at this Station in June, 1913, when eleven head of pure-bred Ayrshire females were transferred from the Central Experimental Farm, Ottawa, to this Station. Added to this number was a 2-year-old Ayrshire bull, transferred from the Experimental Farm, Nappan, N.S. These cows were all of the choicest breeding and are excellent individuals. All the cows 2 years and over were in calf to the pure-bred Ayrshire bull at the Central Experimental Farm, "Monarch of Tanglewyld" 36442, son of the famous Ayrshire cow "Primrose of Tanglewyld" 15943. Hence, all the first crop of calves on this Farm are by this noted sire. When transferred to this Station, all cows and heifers, excepting one, were dry. Seven of these have calved during the fall and early winter, giving four heifer calves and three bull calves. Herewith is submitted a list of the foundation herd:—

	Years.
Marjorie 2nd—22196	9
Marjorie 4th—28101	6
Sonoy 3rd—29604	7
Flavia's Girl—32565	6
Duchess Flavia—36408	3
Denty 3rd's Own—36442	3
Flavia Spot—36412	3
Jessie G.—36407	2
Princess Denty—36411	2
Margaret Ottawa—36413	2
Margaret 2nd—38051	1

As no cows have completed a full lactation period, no complete records for this year will be given until the annual report for the coming fiscal year. However, returns as given below will show the fact that the cows have produced profitably to date:—

Number of cows		7
Total number of milking days		1,203
Amount of milk produced	lb.	28,873
Average production of milk per cow	lb. per day.	24
Milk sold at 4 cents per quart	$	461 96
Amount of expenses during that time	"	196 15
Profit	"	265 81
Average profit per cow	"	37 97

Taking into consideration the fact that three of these seven head milking were heifers with their first calf, and that the stabling conditions until nearly the end of the fiscal year were most unfavourable, these returns are quite satisfactory. These cows were installed in the new barn on the 1st of March, 1914.

In connection with the pure-bred herd, there will also be conducted, at this Station, a dairy cattle grading experiment. This experiment will entail the purchase of a number of average heifers of common breeding with which only pure-bred Ayrshire bulls will be used. Preparations are being made to commence this experiment during the first of the coming fiscal year, and a more complete report of the outline and progress of the same will be given in the report for the coming fiscal year.

A GOOD COMMERCIAL DAIRY BARN.

During the past year a dairy barn was erected at this Station. The following is briefly a description of this complete modern commercial dairy barn, illustrating capacity, strength, lightness of structure, convenience, light, and ventilation.

This is called a good commercial dairy barn for the reason that many dairymen much prefer having the calves and bulls in the same barn with the cows, and in fact this is the common practice throughout Canada. Although this may not be conducive toward the most economical manufacture of the very purest milk, yet such a system has many advantages. This barn contains box stalls, feed rooms, calf pens, milk room, and, in fact, is a complete barn which will house all classes and ages of dairy cattle.

The plans and specifications herewith submitted may be changed to suit the location, the convenience, or the taste of any farmer; but in essentials, at least, represent the ideal of this type of dairy barn, both as to appearance, convenience, economy, and efficiency.

A brief outline of the specifications is as follows:—

1. Foundation.

The foundation is of concrete. A concrete footing, 18 inches wide and 18 inches deep, supports the foundation walls. The concrete foundation walls extend 2 feet above the floor level inside the barn, excepting where adjoining the root cellar under driveway, where the foundation wall extends full height of the cattle stable. This foundation wall is 18 inches in thickness, to which the sill is firmly bolted with cement bolts. A 3-inch tile just below and outside the footing of wall was installed to prevent the heaving and cracking of foundation.

2. Superstructure.

The superstructure is of wood, hip roofed, plank frame, and the roof covered with best quality of galvanized metal shingles. The sills are made of two ply 2- by 8-inch plank with broken joints, well spiked together. Wall posts and studding are made of 2- by 8-inch plank. The purlins and plates are also made of two ply 2- by 8-inch planks, well spiked with broken joints. The truss is made from 2- by 10-inch and 2- by 6-inch planking. The purlin brace is made of two ply 2- by 10-inch bolted 2 inches apart to receive braces and props and also to receive the ridge brace, which is also 2- by 10-inch. All short braces and cross braces of truss are made from 2- by 6-inch planks. Floor joists are made of 2- by 12-inch planks on 22-inch centres. Girths holding joist are made of five ply of 2- by 12-inch, these resting on 6-inch wood posts along the line of calf pens and bull stalls and on 3½-inch steel columns along the lines of cattle ties. Rafters are of 2- by 6-inch plank.

The covering of the frame is as follows: The walls are built from the outside with battens, 1-inch planed boards, one ply building paper, 2- by 8-inch studs and posts, one thickness of heavy fibre wall paper called "Linofelt," and seven-eighths inch matched lumber on the inside. This sheathing is only for the stable below. In the storage barn above stable, the studs and posts are exposed. The rafters are covered with inch boarding, one ply of good building paper to preserve the underside of shingles, and best quality metal shingles. The floor of the storage barn above cattle is composed of one-ply inch lumber laid angle-wise to thoroughly tie the barn. In the drive floor this is covered in turn with 2-inch hemlock planking, while over the balance of floor the covering is inch lumber nailed lengthwise of the barn. Building paper is used between the two ply of lumber in the floor of barn to keep dust from settling through

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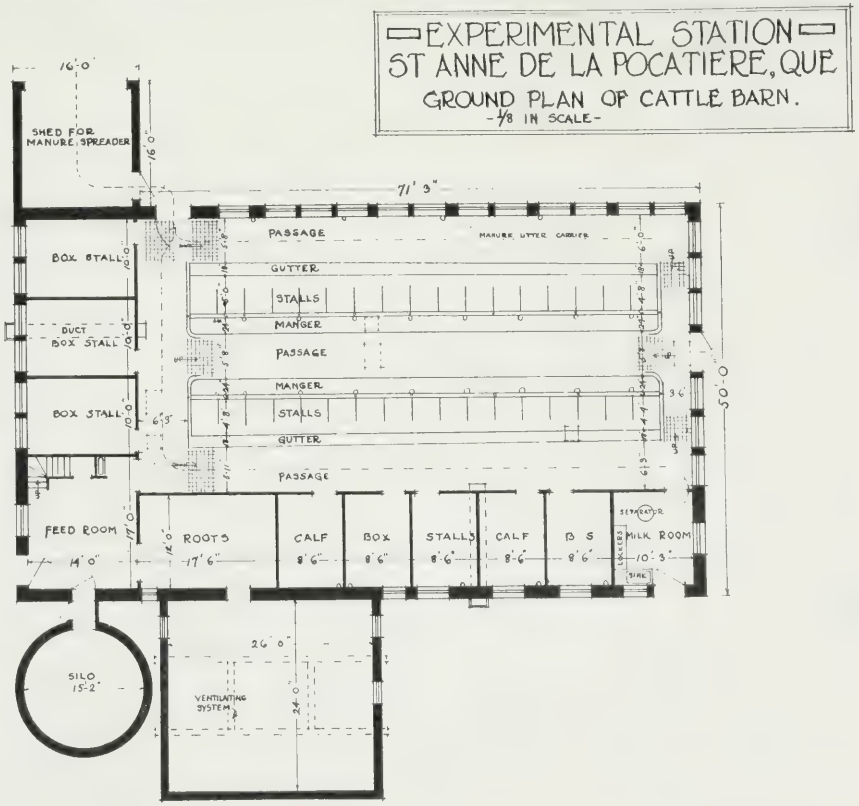
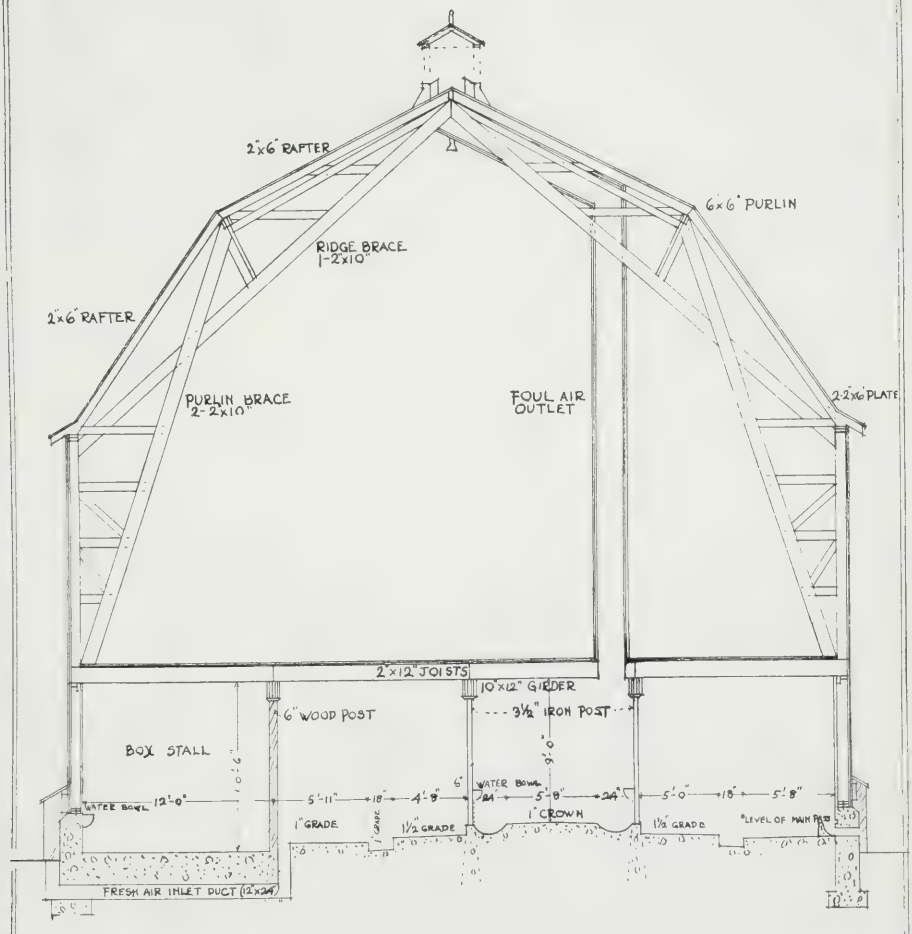

EXPERIMENTAL STATION
ST ANNE DE LA POCATIERE, QUE
GROUND PLAN OF CATTLE BARN.
-1/8 IN SCALE-
16'0"
SHED FOR MANURE SPREADER
16'0"
71' 3"
PASSAGE
MANURE LITTER CARRIER
BOX STALL
GUTTER
STALLS
MANGER
DUCT
BOX STALL
PASSAGE
MANGER
BOX STALL
STALLS
GUTTER
PASSAGE
50'-0"
FEED ROOM
14'0"
17'0"
ROOTS
17'6"
CALF BOX
8'6"
8'6"
STALLS
8'6"
CALF
8'6"
BS
8'6"
SEPARATOR
MILK ROOM
10'3"
SILO
15'2"
26'0"
VENTILATING SYSTEM
24'0"

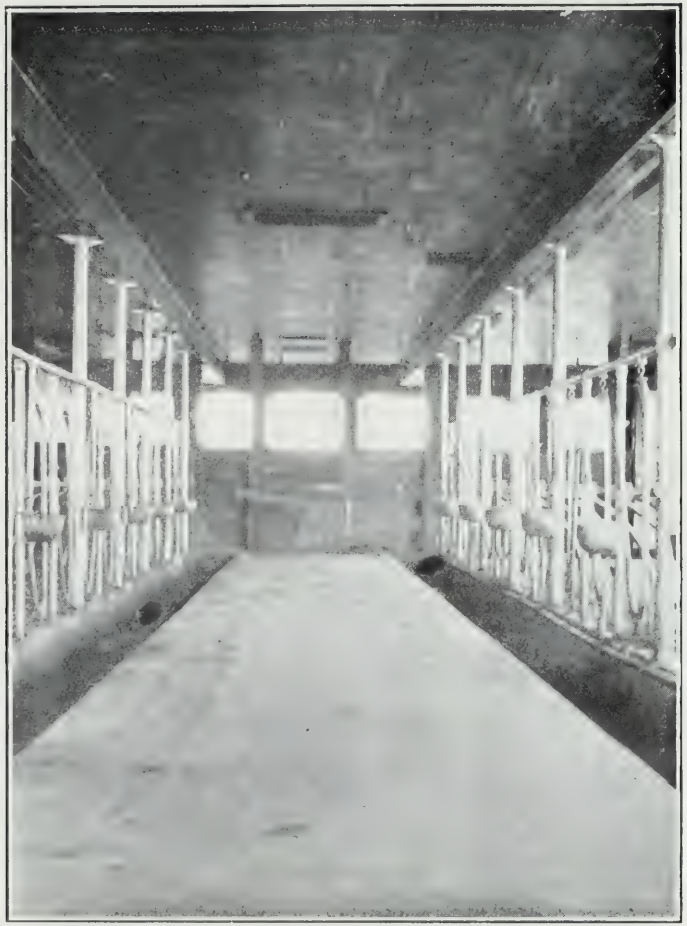
EXPERIMENTAL STATION
ST. ANNE DE LA POCATIERE, QUE

CROSS SECTION THROUGH BARN
1/4 IN SCALE.

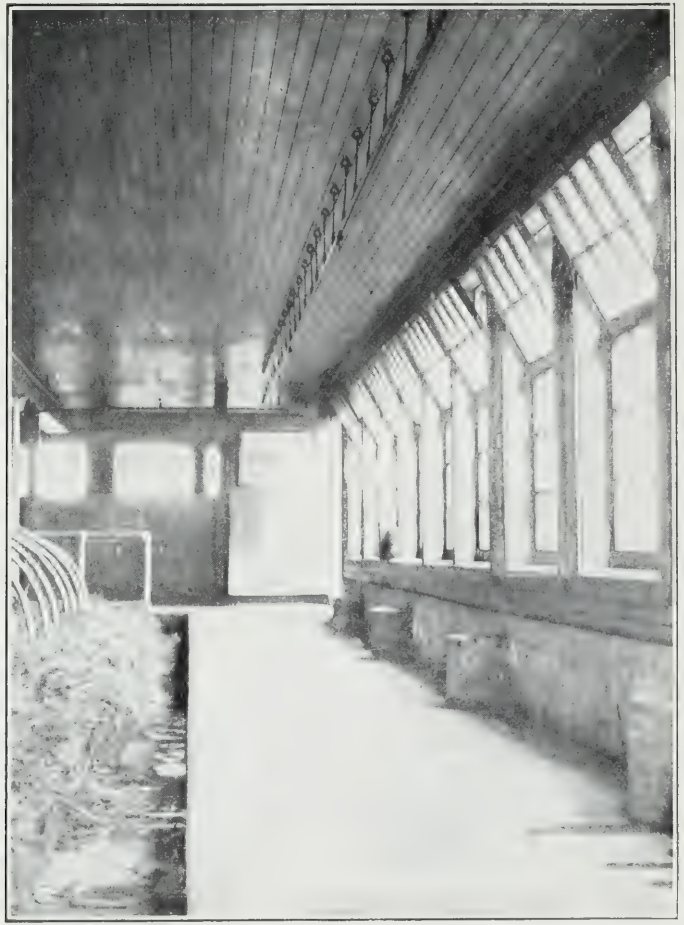


Cattle Barn, Ste. Anne de la Pocatière. Note the lighting and hoods of fresh air intakes.

Experimental Station, Ste. Anne de la Pocatière, Que. Horse barn to right.



Dairy Barn, Ste. Anne de la Pocatière. Centra feed Passage.
Note the foul air outlets.



Cattle Barn, Ste. Anne de la Pocatière: Manure Passage.
Note the fresh air intakes.

the floor into the cattle barn beneath. Dressed matched lumber is used in flooring in order to give a dead air space in ceiling for better ventilation, and also to dispense with the dust-collecting space between joists.

3. Dimensions.

The main barn is 86 by 50 feet outside measurement. The ceiling of stable is 10 feet in height from the manure passages, 9 feet in height from the feed passage, and 10 feet 6 inches in height from the floor of box stalls. The wall post in storage barn is 14 feet clear above floor, thus making a total height of post above the sill of 22½ feet, to which is added 8 inches for plate and sill.

The cattle stands from end to end are of different lengths, one varying from 5 feet to 4 feet 8 inches, and the other from 4 feet 8 inches to 4 feet 4 inches. All the tie stalls are 3 feet 6 inches in width to centre of divisions. The feed passage is 5 feet 8 inches wide. Mangers are 24 inches wide; division between manger and stand, 6 inches wide; and gutters 18 inches wide, with sloping bottoms. The box stalls vary in width from 8 feet 6 inches to 10 feet, and are 12 feet deep, excepting three boxes at end of barn, which are 14 feet deep.

4. Cement Finish.

The 2 feet of cement wall above the floor, the floors of milk room, the mangers, and gutters were finished perfectly smooth. Feed passages were given a smooth finish and then rolled. Cattle stands and floor of box stalls were given a true but rough finish with a wood float. The manure passages and the main passage were given a smooth finish and then heavily rolled with a cement roller to give the pebbled finish, this to prevent cattle from slipping. The grades at the ends of manure passages and feed passages were cross-lined at every 5 inches and also rolled.

5. Levels.

All the floors in the stable are of concrete. The two manure passages running lengthwise of barn are 4½ inches lower than the passages at end of rows, while the feed passage is again 4½ inches higher than end passages. The rear of stand is 2 inches higher than the manure passage at gutter. The manger bottoms are 1½ inches higher than the front of stands. The divisions between manger and stand are of concrete, the same being 7 inches higher than front of stand and 5½ inches above the manger bottom. The manger is of the continuous type, the top of feed passage forming the outer side of manger. The manure gutters are 7½ inches deep next the stand and 6 inches deep next manure passage.

6. Slopes.

The cattle stands have a slope of 1½ inches from front to rear. The main feed passage has a crown of 1 inch to centre. The manure passages have a fall toward gutter of 1 inch. The bottom of gutter is one-half inch higher next the cattle stand than next the manure passage, and the gutter slopes to drain at one end in the proportion of 1 inch per 25 feet, with an extra inch in the last 2 feet toward drain. These slopes facilitate the cleaning out of liquid manure, as well as the keeping clean of the tails of the cows. The mangers have the same slope toward drain at end as manure gutters. The sides of the gutters are vertical, while manger bottoms are curved.

The slopes from manure passages and feed passage to end passage are at the rate of 1 inch per foot, the finish being deeply grooved in squares. The floor of the milk room slopes to a floor drain at one side at the rate of 1 inch per 6 feet.

Ste. Anne.

7. Light.

As much light as the strength of walls would permit was installed in this barn. The windows in walls and doors were made as large as possible. The cattle barn will accommodate thirty four cows tied, two bulls in box stalls, and twenty calves and heifers in the remaining boxes. The barn is lighted by 650 square feet of glass, or at the rate of 12·87 square feet per head. Direct sunlight reaches every part of the barn, which renders it most sanitary, bright, and cheerful.

8. Ventilation.

A modified Rutherford system of ventilation is used in this barn. On the south side the fresh air intakes are brought in at the floor level and carried up to the height of 10 inches against wall. These intakes are constructed from sewer pipe elbows, being 6 inches in diameter. On the north side and east end, ventilator ducts had to be made under box stalls.

Fresh air is admitted through the walls at or near floor level. Cement casing guards are placed around all fresh-air intakes in order to cut down possibility of damage and to exclude dirt.

Ventilator boxes on the outside of walls extend 3 feet above the pipe opening in wall. These ventilator boxes are resting on small cement bases to prevent decay, and contain openings in the sides near top. The fresh air entering thus describes a deep parabola, thus preventing strong direct air currents, yet supplying a uniform, adequate flow of fresh air for the barn. The area of each opening in the intake box is equal to the area of the intake pipe. Dampers are installed in these boxes to control the flow of fresh air.

The area of intake ducts per head is about 14 square inches.

The foul-air outlets are three in number, each being 18 square inches in diameter, inside measurement, and thoroughly insulated to prevent condensation of moisture. These outlets are not placed in the centre of building but alternately in each side, extending from ceiling of stable to roof, and following the line of upper rafters to barn peak, thus straddling the hay track in loft, yet using the cupolas on ridge as outlets. These foul-air outlets are constructed as follows: From the outside, one ply of matched lumber, inch battens and air space; one ply of building paper and one ply of matched lumber on the inside. This makes a perfect foul-air outlet. The area of outlet for this stable is 30 square inches per cow. The damper at the lower end of foul-air outlet, swivelling in the centre with control cords extending to the stable below, is used to control the outgoing air.

The windows of this barn throughout, excepting in box stalls, are of two sashes, the upper one of which is hinged to the lower sash, opening inward from the top. These may be tilted at any angle by means of a cord operating a small pulley on a worm spindle. Such a device costs in the vicinity of 50 cents each, is easy to operate, and prevents the slamming of windows and the consequent destruction of glass. When warm weather necessitates more fresh air than is admitted through the fresh air intakes, the windows are opened as needed. From an ideal dairy barn viewpoint, if screens were supplied for the windows and sashes in the dairy of this barn for the summer months, it would allow the taking off of windows during the heat of summer and yet prohibit the entrance of flies.

The ventilation of the root cellar is on the same principle as that of the barn. However, the fresh air is conducted through the walls at a height of about 6 feet above floor, but is carried down to floor level before being dispersed. On the floor is a slatted system of ventilator boxes, which allows the air not only to go from opening to opening, but at the same time to work its way gradually upward through the roots. If

necessary, upright slatted shafts may be provided to the trap doors for filling. The fresh air intakes are controlled by double dampers, which can be closed after the roots are cooled, thus prohibiting the entrance of frost.

9. Accommodation.

The cattle barn will accommodate thirty-four milch cows standing in all-steel stalls and tied by means of swinging steel stanchions, and also the eight box stalls will accommodate twenty-two bulls, heifers, and calves.

A separate milk room, well equipped with lockers and sink, etc., is contained in the northwest corner of barn. This milk room being farthest away from the manure pit and feed room, facilitates cleanliness of the milk. A self-closing door from the milk room to the barn ensures the exclusion of dust.

In the southeast corner of barn there is a small open shed sufficiently large to accommodate a large manure wagon. This provided with a concave cement floor facilitates the keeping of the manure away from the barn with the least possible labour. The exclusion of the manure from the vicinity of a dairy barn is absolutely essential in order to make the best flavoured and purest milk, and also to prohibit the breeding of flies in the vicinity of the barn.

A commodious feed room is provided in the northeast corner of stable, into which enter the silo and the root cellars. Into this feed room dump four meal chutes from the meal room above, A stairway to meal room, properly fitted with closets and sink underneath, makes this an ideal place for the mixing of feeds.

The meal room above the feed room is of the same size as feed room, and is well fitted with hopper-shaped bins and with chutes extending to feed room below.

The rest of this end of the storage barn is taken up with a granary.

The root cellar under driveway is sufficiently large to accommodate approximately 4,000 bushels of roots. This root cellar has a ceiling of reinforced concrete, the same being floor of the driveway to barn. Contained in this ceiling are two watertight traps for the filling of the root cellar. Adjoining this root cellar in the barn is a smaller emergency root cellar sufficiently large to accommodate approximately 1,600 bushels of roots.

The silo opening into feed room has a capacity of approximately 140 tons.

A litter carrier is installed throughout the barn, which takes the manure to the small manure shed and runs it directly over the cart there placed for the reception of all litter. All manure is hauled directly to the fields.

The distribution of feed is done by means of two low, three-wheeled trucks. The meal truck is fitted with bins to accommodate three different meal mixtures or straight meals. The ensilage truck is of the large hopper-shaped type, accommodating 20 bushels. It might be well to again mention that experience with these trucks has shown distinct superiority over the suspended feed carriers.

10. Water.

Individual basins are provided for the tie stalls and all calf boxes. For comparative purposes, two systems representing two types were installed. For one row of cow stalls and the calf boxes a good underfeed system of bowls was installed with two control tanks to regulate the same. On one of the rows of ties an overhead feed system was installed. This latter, however, has not given very good satisfaction as yet, but it is hoped that remodellings will materially improve the same, for it has many distinct advantages over the underfeed system in principle, although as yet not in practice. These water systems to date have been fairly satisfactory and are much more convenient and cleanly than watering in the mangers or with buckets. The bull boxes were not supplied with water basins owing to the possibility of breakage, thus causing the flooding of the stalls. Hence the bulls are watered with pails.

Ste. Anne.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

DUAL-PURPOSE AND DAIRY CATTLE.

The breeding herd consists of thirty-one head of cattle as follows:—Shorthorn: 2 bulls, 16 milch cows, and 8 heifers and calves. Ayrshire: 1 milch cow. Grade: 2 milch cows, and 2 calves.

The Shorthorns are mostly of the dual-purpose type and are being bred for capacity of milk production as well as for suitability for beef. There is a great demand in Western Canada for cattle of this type, and large numbers of both sexes could be sold to farmers in all parts of the country if there were more obtainable. It has been found impossible to sell females this year as the herd is small and all heifer calves were retained to increase the herd. Nine bull calves were sold during the year

MILK RECORDS.

The following milk records are for the last complete lactation period of the cows now on hand. In addition to the cows recorded there are six young cows which have not yet completed their first lactation period.

Name of Cow.	Breed.	Age at beginning of lactation period.	Date of dropping calf.	Number of days in lactation period.	Total pounds of Milk for period.
Ottawa Marchioness 5th	Shorthorn	4	Dec. 21, 1912.	387	11,334
Illuminata 3rd	"	7	Nov. 25, 1911.	443	10,287
Duchess 3rd	"	5	Dec. 4, 1912.	285	9,621
Ottawa Janet 4th	"	3	Mar. 18, 1913.	401	8,462½
Buttercup	Grade	6	July 3, 1912.	443	7,578
Ottawa Janet 3rd	Shorthorn	4	Oct. 2, 1912.	334	6,598½
June of Brandon	"	7	Mar. 28, 1913.	365	6,042
Rose of Brandon	"	9	April 16, 1912.	305	5,832½
Daisy of Brandon	"	8	April 1, 1912.	271	5,530½
Illuminata 4th	"	6	Feb. 22, 1912.	306	5,410
Poppy of Brandon	"	6	May 29, 1913.	200	3,284½
Brandon Beauty	"	5	May 28, 1913.	126	2,287
Ottawa Marchioness 2nd	"	8	April 9, 1913.	164	580[1]

[1] Due to attack of inflammation of udder.

A Babcock test outfit was purchased during the season and a commencement made at testing the percentage of butter fat in the milk produced by each cow. A test is made on the 5th and 20th of each month. As the test was started in the latter part of the year, there are, as yet, no complete reports ready for publication.

WINTER RATIONS FOR DAIRY COWS.

The daily winter ration fed the dairy cows is on the average about as follows:—

Hay (clover and grasses mixed or alfalfa)	lb.	6
Straw	"	8
Corn silage	"	32
Roots	"	6
Grain (chiefly oats and bran)	"	5 to 14

The meal ration varies with the flow of the milk and is usually 1 pound to about 3 or 3½ pounds of milk.

COST OF MILK PRODUCTION.

On April 1, 1913, a start was made at keeping the exact weight of each kind of feed given to each individual cow. This will make it possible to know the cost of producing milk from each cow, and also the profit or loss returned by each cow As most of the lactation periods reported on began before this system of weighing feed was started, it is not practicable to show the profit and loss from every cow. Three typical cows that freshened about the time the individual feed records were started are chosen, one above average, one about average, and one of the poorest; the results from these three cows are as follows. The labour is not considered, neither is the value of the calf and of the manure.

Ottawa Janet 4th (3 years old).

Calved March 18, 1913; milked to March 31, 1914.
Feed consumed, April 1, 1913, till March 31, 1914:—

2,094 pounds grain (oats, barley and bran) at $20 per ton	$	20 94
775 pounds mixed hay at $10 per ton		3 88
569 pounds alfalfa at $12 per ton		3 41
775 pounds mixed hay at $10 per ton		3 88
1,421 pounds straw at $2 per ton		1 42
6,991 pounds corn ensilage at $3 per ton		10 49
1,653 pounds roots at $3 per ton		2 48
5 months pasture at $1 per month		5 00
	$	47 62
Milk produced from April 1 to March 31, 8,045 pounds at 1½ cent per pound	$	120 67
Profit on milk over cost of feed		73 05
Cost of feed to produce 100 pounds milk		59

Jane of Brandon (7 years old).

Calved March 28, 1913; milked till March 28, 1914.
Feed consumed April 1, 1913, to March 31, 1914:—

1,879 pounds grain (oats, barley and bran) at $20 per ton	$	18 79
569 pounds alfalfa at $12 per ton		3 41
775 pounds mixed hay at $10 per ton		3 88
1,421 pounds straw at $2 per ton		1 42
6,991 pounds corn ensilage at $3 per ton		10 49
1,653 pounds roots at $3 per ton		2 48
5 months pasture at $1		5 00
	$	45 47
Milk produced from April 1, 1913, to March 28, 1914, 5,956 pounds at 1½ cent per pound	$	89 34
Profit on milk over cost of feed		43 87
Cost of feed to produce 100 pounds milk		76

Poppy of Brandon (6 years old).

Calved May 29, 1913; milked till December 28, 1913.
Feed consumed April 1, 1913, to March 31, 1914:—

1,535 pounds grain (oats, barley and bran) at $20 per ton	$	15 35
569 pounds alfalfa at $12 per ton		3 41
775 pounds mixed hay at $10 per ton		3 88
1,421 pounds straw at $2 per ton		1 42
6,991 pounds corn ensilage at $3 per ton		10 49
960 pounds roots at $3 per ton		1 44
5 months pasture at $1		5 00
	$	40 99
Milk produced from May 29, 1913, to December 15, 1913, 3,284½ pounds at 1½ cent	$	49 27
Profit on milk over cost of feed		8 28
Cost of feed to produce 100 pounds of milk		1 25

COST OF FEED FOR MATURE BULL FOR ONE YEAR.

Butterfly King 21st (age 4 years). Weight at beginning of year, 2,070 pounds. Weight at end of year 2,335 pounds.

Feed consumed April 1, 1913, to March 31, 1914:—

2,609 pounds grain (oats, barley and bran) at $20 per ton	$	26 09
638 pounds alfalfa at $12 per ton		3 83
2,400 pounds mixed hay at $10 per ton		12 00
2,056 pounds straw at $2 per ton		2 06
8,179 pounds corn ensilage at $3 per ton		12 22
540 pounds roots at $3 per ton		81
Total cost for year	$	57 01

COST OF RAISING HEIFERS.

Brandon Maid 2nd (from birth to six months).

Born September 29, 1913. Weight at birth, 65 pounds. Weight March 31, 1914, 390 pounds.

Feed consumed September 29, 1913, to March 31, 1914:—

2,199 pounds whole milk at 1½ cent per pound	$	32 98
134 pounds corn silage at $3 per ton		20
24 pounds straw at $2 per ton		2
24 pounds alfalfa at $12 per ton		6
153 pounds mixed hay at $10 per ton		77
144 pounds grain (oats and bran) at $20 per ton		1 44
Total	$	35 47

Marchioness 9th (from 3 months to 15½ months).

Born December 21, 1912. Weight April 1, 1913, 165 pounds. Weight March 31, 1914, 735 pounds.

Feed consumed during year:—

2,604 pounds of whole milk at 1½ cent per pound	$	39 06
1,680 pounds corn silage at $3 per ton		2 64
364 pounds straw at $2 per ton		36
460 pounds alfalfa at $12 per ton		2 86
427 pounds mixed hay at $10 per ton		2 13
594 pounds grain (oats, barley, and bran) at $20 per ton		5 94
Total	$	52 99

Brandon Marchioness Bess (from 16½ months to 28½ months).

Born November 20, 1911. Weight April 1, 1913, 785 pounds. Weight March 31, 1914, 1,185 pounds.

Feed consumed during the year:—

5,943 pounds corn silage at $3 per ton	$	8 96
78 pounds straw at $2 per ton		78
371 pounds alfalfa at $12 per ton		2 23
751 pounds mixed hay at $10 per ton		3 75
630 pounds grain (oats, barley and bran) at $20 per ton		6 30
Total	$	22 02

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT, T. J. HARRISON, B.S.A.

DUAL-PURPOSE CATTLE.

On the Indian Head Experimental Farm at present there are in all about forty-eight head of breeding cattle, made up as follows:—

Shorthorns: 1 bull, 7 aged cows, 16 milch cows, 9 two-year old heifers, 3 yearling heifers, 2 heifer calves, 6 bull calves.

Grades: 4 cows.

These are not all dairy cattle, as a number of the cows are of strictly beef type. The object, however, of maintaining the herd is to develop, if possible, the dual-purpose Shorthorn; in other words, a non-specialized farmer's cow. With this end in view, during the fall of 1913 there was purchased a yearling bull, "King Edward," of a good milking strain, and sired by "Butterfly King," one of the best dairy sires of the breed in Canada. With this bull at the head of the Shorthorn herd, in which are already a few promising individuals, there is hope of developing a profitable milking type that would be suitable to the average farmer in southern Saskatchewan. Among the young cattle especially there are some fair individuals, and with the culling out of a number of old cows whose days of usefulness are over, we will be in possession of some good foundation stock which, with judicious handling, should develop into a creditable herd of dual-purpose Shorthorns.

In former years this herd was treated strictly as a beef herd, the calves being allowed to suck their dams. Now, all the cows are being milked by hand and a record taken of the amount of milk and butter-fat produced in each lactation period. None of the cows have yet completed a lactation period since the commencement of keeping records, and therefore cannot be reported further than that three or four are milking very satisfactorily. One drawback is found to this work. It is that the cows that have suckled their calves in former years have commenced to drop off in their milk production very early in their lactation period. The reason for this is that the cow was allowed to go dry early when suckling her young and the habit has now become second nature with her. Not much is expected from these cows except that they may raise a few promising heifers. Therefore, our most reliable foundation will be the heifers that are yet to freshen.

This experiment will require a number of years before results are forthcoming. However, as there is such interest being taken in the dual-purpose cow in the West it seems that the development of this cow would be a profitable line to follow. The grain farmers require a cow that will give a large flow of milk and produce a calf that will develop into a good beef steer.

It is also the endeavour to begin an experiment to determine the profits from a dual-purpose herd by keeping data in regard to the cost of production of milk and butter-fat from the cows, and the cost of rearing calves, yearlings, and 2-year-old Shorthorn heifers.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

DAIRY CATTLE.

Experiments were conducted in January, February, and March to determine the comparative feeding value of timothy and green feed, and also to fix a value for roots when fed in conjunction with either of these bulky fodders.

The results indicate the advantage of feeding roots in reducing the cost of production of milk. These tests will be repeated next season to verify the results before publishing.

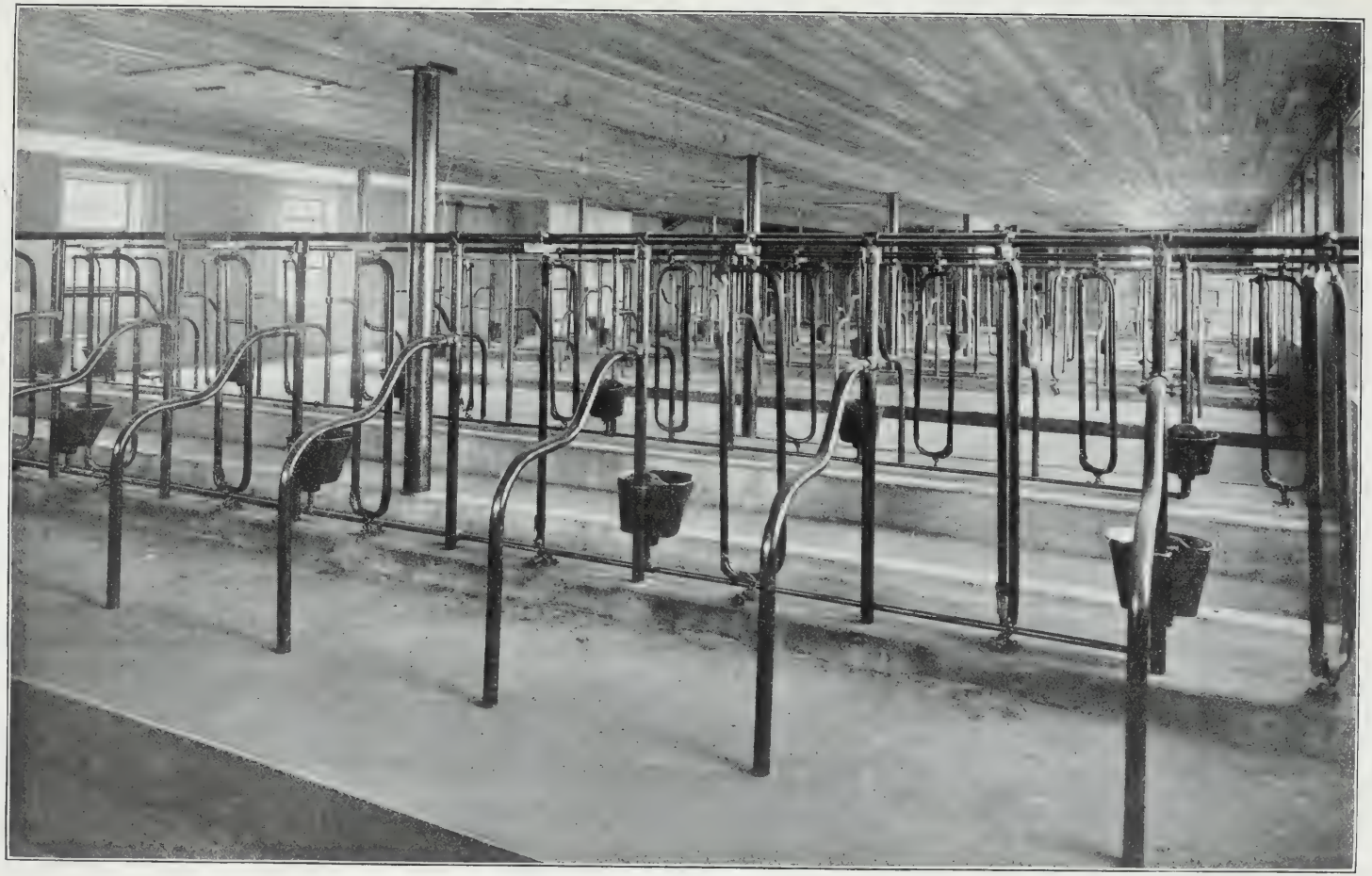
Nineteen head comprise the herd of pure-bred Holstein cattle, eleven of which are females of breeding age. Besides those whose records are published herewith, a number are making a very satisfactory showing. Not having completed their lactation period at the end of the fiscal year, their production to date is not shown. The heifer "Lawnerest Rosa Echo" gave 11,143 pounds milk in twelve months after freshening for the first time at about three years of age. The 2-year-old heifer, "Rhode De Kol Beets" produced 7,322·6 pounds of milk from August 3 to March 31. A number of these animals are entered in the R.O.P. test.

The pure-bred Jerseys at this Station now number six, three of which are of breeding age. The 3-year-old heifer "Brampton Wolseley Girl" is making a good showing in her 3-year-old form.

Records are being kept of the production of a number of grade cows which were selected in the hope of being able to secure a grade herd representing the average dairy herd of the province. These cows are being bred to the Holstein bull "Royalton Korndyke Count" 13237, whose pedigree is one of the best in Canada. The object of this experiment is to determine the influence of the sire of high-producing pedigree in raising the production of common herds by grading up.

Brandon: Ottawa Marchioness 5th (dual-purpose Shorthorn). Gave 11,335 lb. of milk in one milking period.

Brandon: Illuminata 3rd (dual-purpose Shorthorn). Gave 10,387 lb. of milk in one milking period.



Interior of Dairy Stable, Indian Head, Sask.

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Part of Dairy Herd, Lacombe, Alta.

DAIRY COW RECORDS.—Record of Dairy Herd, Lacombe Station.

Name of Cow.	Age at beginning of Lactation Period.	Date of Dropping Calf.	Number of days in Lactation Period.	Total pounds of Milk for Period.	Daily average yield of milk.	Value of Milk at $2 per cwt.	Total value of product.	Amount of meal eaten at 1 cent per pound.	Amount of Roots eaten at $3 per ton.	Amount of Hay eaten at $10 per ton.	Amount of Green Feed eaten at $10 per ton.	Months on pasture at $1 per month.	Total cost of feed between Calvings.	Cost to Produce 100 lbs. Milk.	Profit on 100 lbs. Milk.	Profit on Cow between calvings (labour and calf neglected).
				lb.	lb.	$ cts.	$ cts.	lb.	lb.	lb.	lb.		$ cts.	cents	$ cts.	$ cts.
Lawncrest Lee Beets ..... Hol	2	Feb. 26, 1913	365	8166·7	22·4	163 33	163 33	1,702	2,837	2,470	2,907	5½	53 65	65·7	1 34	109 68
Maud Sarcastic ..... Hol	2	Feb. 11, 1913	332	6326·1	19·1	126 52	126 52	1,581	865	1,745	2,467	5½	43 66	69·0	1 31	82 86
Princess Margaret Helbon Hol	2	Feb. 9, 1913	444	9923·8	22·3	198 48	198 48	1,974	2,575	2,345	3,291	5½	57 27	57·7	1 42	141 21
Concordia Princess ..... Hol	5	Feb. 25, 1913	272	6162·4	22·7	123 25	123 25	1,232	.....	1,370	2,131	5½	35 32	57·3	1 43	87 93
Brampton Wolseley Thelma Jer.	3	Nov. 24, 1912	341	5054·1	14·8	101 08	101 08	1,262	.....	1,964	2,278	5½	39 33	78·8	1 21	61 75
Grade Holstein No. 13	2	Apr. 25, 1913	309	7732·1	25·0	154 64	154 64	1,925	.....	1,782	2,780	5½	47 56	61·0	1 39	107 08
Grade No. 5	9	Feb. 13, 1913	284	5811·1	20·5	116 22	116 22	1,458	.....	1,831	2,053	5½	39 49	67·9	1 32	76 73
Grade No. 1	4	Jan. 1, 1913	365	7230·3	19·8	144 61	144 61	1,813	508	2,275	3,124	5½	51 38	71·1	1 29	93 23
Grade No. 7	7	Dec. 25, 1912	329	7923·4	24·1	158 47	158 47	1,995	.....	1,863	2,736	5½	48 44	61·1	1 39	110 03
Grade No. 4	8	June 1, 1913	176	3087·7	17·5	61 75	61 75	871	.....	288	361	5	16 95	54·9	1 45	44 80
Grade No. 31	3	June 4, 1913	241	3723·2	15·5	74 46	74 46	1,020	715	1,147	1,317	5½	31 30	84·1	1 16	43 16
Average of 11 head	5		314	6467·3	20·3	129 35	129 35	1,530	682	1,735	2,313	5·4	42 21	66·2	1 34	87 13

DAIRY PRODUCTS.

The complete equipment for the dairy was slow in arriving, rendering it impossible to finish the installation till November. The boiler was the last to arrive, but since hot water was available from the furnace in the basement of the dairy building for some time, work of the dairy was not seriously handicapped for lack of live steam. Sweet cream has been shipped to Edmonton during the entire season, and for this cream the current price has been received, which is at present on the basis of 34 cents per pound butter fat f.o.b. Lacombe. Commencing in July, cream cheese have been made in limited numbers, and have been offered the local market. As yet the quality of these cheese appears somewhat variable in character and it cannot be said at present that a market for this product has been established. Those who are within shipping distance of Edmonton and Calgary find a profitable outlet in these cities for milk, cream, and butter.

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

DAIRY CATTLE.

The most important work in the dairy herd of Holstein-Friesian cattle this past year has been: first, the breeding work; and second, the testing of the various individuals with the object of having uniform groups for experimental purposes. Five grade cows of the original herd have been sold to the butcher. For various reasons they were both unprofitable and unsuitable for experimental work.

Only one loss is reported during the year. Cow No. 27 died from septicæmia at calving time, in spite of the fact that the best of veterinary attention and nursing had been given her. The only other serious trouble encountered this year was the poisoning of a yearling heifer in March; this did not prove fatal. The heifer is suspected of having eaten something poisonous in the field when first turned out. She became totally paralyzed but was treated for dietetic poisoning and very slowly recovered. Some inconvenience was experienced with sore teats, but as soon as there was a change from hard to liquid soap for washing the milkers' hands, the trouble disappeared. This may have been only a coincidence, but it seemed at the time that the infection was being carried on the cake of soap. However, no bacteriological tests were made, but when the liquid soap was used the trouble disappeared.

Of the twenty cows which finished a lactation period this year, 50 per cent gave heifer calves; all of these calves were raised. The 2-year-old heifers of unknown breeding have grown well, and some are about ready to freshen. They were divided into two groups for breeding. One lot was bred to come in at 24 to 25 months of age, and the others bred to come in at 28 to 30 months. Nearly all the yearlings will be carried over and bred to come in during the autumn, when they will be, as near as possible, 30 months old. The average results for the whole herd are better this year than they were last year. The cows have become thoroughly acclimatized and are responding more to food and care. The average lactation period is not as long as last year, because it did not pay to keep some of the old grade cows unless they had a calf at least once in twelve months.

The increase is also partly due to feeding silage during the summer when the pasture became short. There are several cows to be culled out of this herd during the next year. They will be discarded as soon as the heifers are ready to replace them.

It seems well to say a word here concerning the method of handling the cows during the past year. The treatment is substantially the same as that given last year, with a few exceptions. The cows are milked at 5 a.m. then fed silage, roots, and grain. After breakfast the cows are turned out and the stables are cleaned, and fresh bedding is put down. If the weather is fine the cows remain out until 1.30 p.m., and if it is cold or wet they are let in as soon as the stables are prepared. At three o'clock they are again fed silage, roots, and grain, after which they are prepared for milking, which begins at 4.30 p.m. After milking, the floors are swept, and, lastly, the cows are given a feed of long hay, which they eat up clean before morning. Where silage is fed heavily, this method has proved more economical than when the hay is chaffed and fed with the silage. It has, besides, two distinct advantages: it gives the cows some-

taing to work at during the longer period between feeds, and also it keeps down the dust during milking.

When the cows are groomed it is generally done as soon as they have come in from the yard. In summer they are in the stable only as long as it takes to milk them or to feed anything which may be given to supplement pasture.

Below is given a table showing the records of each cow which has finished a lactation period since the last report. At each milking the milk was weighed and a small quantity taken for a composite sample; these samples were tested every five days, thus giving a very detailed record of production during the whole period. Accurate figures were taken of all the food consumed and the cost of this was estimated from the following prices:—

	Per ton.
Clover hay	$ 10 00
Corn silage	3 00
Roots	3 00
Bran (car lots)	20 00
Brewers' grains (dried)	22 50
Soy bean cake	45 00
Oil cake (flax)	45 00
Wheat Germ mea.	33 00
Salt	9 50

AGASSIZ.

Record of Dairy Herd.—Agassiz, B.C.

Cow No.	No. days milked	Total milk produced.	Average per cent. fat in milk.	Amount fat produced in period.	Amount meal consumed.	Amount roots and silage consumed.	Amount of hay consumed.	Amount of green food consumed.	Months on pasture at $2.	Total cost of food for period.	Profit on product.	Cost to produce 100 lb. milk.	Cost to produce 1 lb. of butter.
		lb.	%	lb.	lb.	lb.	lb.	lb.		$ cts.	$ cts.	cents.	cents.
2	247	7005·6	3·3	232·69	1469	8058	1422	1680	3	49·61	82·49	70·81	17·76
4	330	9011·	3·7	334·57	1694	16152	1735	1680	3	60·63	126·92	67·28	15·09
6	298	8033·6	3·44	274·82	1497	11617	1369	1680	3	56·66	98·82	70·	17·18
8	317	7747·9	3·73	285·33	1550	11731	1579	1680	3	55·008	105·082	70·99	16·06
11	272	8042·6	3·66	287·52	1540	7554	1181	1680	3	49·37	117·48	58·65	13·4
13	341	7871·3	3·3	265·06	1668	14244	1753	1680	3	61·65	88·59	78·32	19·38
14	344	7533·6	4·09	308·98	1500	13748	1569	1680	3	54·78	116·66	72·71	15·05
15	280	7003·5	3·9	273·3	1118	11939	1325	1680	3	46·92	105·48	66·99	14·39
16	250	6695·	3·82	254·81	1076	6829	926	1680	3	41·10	101·36	61·40	26·56
17	314	9416·8	3·6	340·08	1761	15309	1691	1680	3	61·39	129·83	65·30	15·04
18	306	6069·9	3·06	186·06	1144	14224	1353	1680	3	49·96	56·72	82·30	22·35
19	288	7656·7	3·47	266·99	1606	9831	1454	1680	3	52·00	98·71	67·85	16·23
20	294	7115·2	3·	214·25	1140	13770	1177	1680	3	46·86	76·27	65·85*	18·23
21	312	8120·	3·2	259·45	1731	13888	1650	1680	3	58·64	89·35	70·21	18·83
22	287	6968·8	3·6	252·67	1267	11781	1347	1680	3	48·92	93·04	70·19	16·13
24	236	6782·9	3·76	252·05	1304	7601·5	1318·5	1680	3	44·90	96·35	66·19	14·84
25	316	9577·9	3·2	306·85	1613	12242	1596	1680	3	54·96	120·01	57·38	14·92
26	262	6655·8	3·6	230·82	1045	8334·5	1025·5	1680	3	40·06	90·32	60·20	14·46
*61	301	11510·6	3·6	415·67	2061	10276	3390	1680	3	60·58	173·15	52·63	12·18
*75	323	10938·7	3·5	390·02	2136	12485	1395	1680	3	63·42	156·20	57·97	13·59
Aver...	296	7987·62	3·52	283·09	1496	11330·7	1532·8	1680	3	52·87	106·14	66·65	16·57

* Pure-bred Holstein cows.

Last year was reported the production of the five most profitable and the five least profitable cows. The difference in profit last year was $50.15. Since that time some of the poorest cows have been culled out, but this year the difference is $62.54. Last year the poorest five averaged $67.68 profit, with a food cost of $36.62; this year the average of this class was $78.68 profit and a food cost of $52.54. The greatest difference is in the best five. A year ago the food of the five best cows cost $54.27 per cow, and they made $117.83 profit. This year the food cost per cow for the best five was $60.19 and they gave a profit of $141.22. This difference can be accounted for by a variety of reasons. First, two pure-bred Holstein-Friesian cows have been added to the herd, and their records are the two best. All the cows are acclimatized and are beginning to respond to good care and food. All the stock was fed more silage, roots, and grain, and the average length of lactation period was not so long. The performances of the most profitable and least profitable five for this year are charted below.

	Number of days milked.	Yield of Milk.	Yield of fat.	Cost of food	Profit over food.
		Lb.	Lb.	$ cts.	$ cts.
Five most profitable cows	301	11510·6	415·67	60·58	173.15
	323	10938·7	390·02	63·42	156 20
	316	9577·9	306·85	54 96	129.83
	314	9416·8	340·08	61.39	120.01
	339	9011·	334·57	60 63	126.92
Average	318·6	10091·	357·438	60.19	141.22
Five least profitable cows	247	7005·6	232·69	49.61	82.49
	341	7871·3	265 06	61 65	88.59
	306	6069·9	183·06	49 96	56.72
	294	7115·2	214·25	46 86	76.27
	312	8120·	259·45	54 64	89.35
Average	300	7236·4	230·902	52.54	78.68

Most Profitable Cow versus Least Profitable Cow.

Cow No.	No. of days milked.	Yield of milk.	Yield of fat.	Cost of food.	Profit over food.
		Lb.	Lb.	$ cts.	$ cts.
61	301	11510 6	415·67	60 58	173.15
18	306	6069·9	183 06	49.96	56 72

Statement for Two Years.

Average of Five Cows	Five most profitable cows.		Five least profitable cows.	
	1912-13.	1913 14.	1912-13.	1913-14.
Number of days in lactation period	345	318	270	300
Total yield of milk.....Lb.	9637·2	10091·0	6136·2	7236·4
Total yield of butter fat.....Lb.	344·2	357·43	208·6	230·90
Total cost of food.....$	54.27	60.19	36 62	52 54
Total profit over cost of food. ....$	117 83	141.22	67.68	78.68

DAIRY STABLE NOTES.

The stable has now been in use for three winters and definite results regarding the construction and fittings from a practical point of view may be mentioned.

The window ventilation has proven quite adequate for this climate. This stable accommodates forty-two head of cows. There are 767 cubic feet of air-space per cow and 10 square feet of glass per cow. Although this space was not filled with full-grown cattle, yet every stall was occupied this past winter.

Careful record has been kept of the temperatures, both morning and evening at 5 o'clock, throughout the housing season. The average morning temperature was 55·06°, and the average evening temperature was 52·8°. The highest morning temperature was 60°, and the highest evening temperature was 66°; the lowest at both times has been 50°. Both extremes occurred in reasonably warm weather in March. The barn has always been free from moisture or foul air.

This past season water bowls were installed, one between every two cows. This improvement cost, including our own labour, $4.10 per cow. Watering from the concrete manger gave good results, considering that there was no money outlay, but the bowl system is an improvement and has none of the objections of the former system. Any protection the bowl system gives to the health of the cows, or any increase in milk flow or general condition, should pay for the cost of installation. In installing this system, the main feed pipe was placed on top of the concrete dyke which holds the stanchions, instead of putting it on the bottom of the manger, as is often done. This is found a decided advantage in that it keeps the mangers clean. (See plate xxviii.)

Last year was reported the stripping of the iron stall fixtures of all their "extras." The barn has been kept thus during this year and is found satisfactory. The iron manger is the most unsightly and unsatisfactory portion of the present equipment.

The gutter, which is 7 inches deep next the cows, 20 inches wide, and 4 inches next the alley, has given the best of results for even our largest cows. The 5-foot stand has proven ample for the largest cows, and has never allowed dirt to collect. The 3-foot 6-inch width has been wide enough for the average, but hardly wide enough for the largest cows, *i.e.*, those over 1,400 pounds. The concrete stand is dry and comfortable, but needs a lot of bedding to prevent teat trouble. Straw was very scarce last year and there was difficulty with bruised teats.

On the whole, the stable is light, airy, comfortable, and convenient to work in, without having any tendency to faddishness or luxury.

CALF REARING.

To date no experiments have been made on the rearing of heifer calves. A few well known general principles have been followed very closely and as yet no failures are to be reported.

It may be useful to some to outline here the method which has been followed and found very satisfactory. The cows, when dry, are fed a small amount of grain and enough succulent food to put them in good condition. As parturition approaches, they are fed some laxative food such as linseed meal (flax oil cake), in addition to the regular ration. In almost every case all the calves born were perfectly healthy. In some cases calves were born with goitre, but, without treatment, this malady has always disappeared. The calf is left with the cow until it has had at least one good meal of the colostrum. It is then taken away and fed three times a day on warm, whole milk. The amount is varied according to the individuality of the calf. They are fed regularly, and each has meal as nearly as possible equal. They are always fed under the limit of their appetites. After three weeks a small amount of skim-milk is added to the ration. The skim-milk is increased gradually until at four months of

age, all the whole milk is supplanted by skim-milk. At about three weeks of age the calves are taught to eat bran and oats, and in a week or two later, some pulped mangels and silage are added. After the first month clean water is kept before them all the time. The chop and roots are seasoned with a little salt. Clover hay is kept before them all night.

The pens are light and well ventilated, clean, and not over-crowded. The calves are allowed into the yard to exercise when the weather is favourable. They are never left out in extreme wet, cold, or heat.

One thing in which great care has been taken is the cleanliness of the pail from which the calf drinks. These pails are washed after each feed, and although it takes time, it is time well spent.

The points which we try to keep in mind and practise are: Good food, regularly given; light pens, kept clean and dry; and reasonable exercise, with protection from extremes.

Below is given in detail the average cost of a bunch of calves, grown to 1 year of age. These calves were never fat, but were always in thrifty, growing condition throughout the entire year.

COST TO RAISE GRADE HOLSTEIN-FRIESIAN HEIFERS.

First period, 225 days—		
Average weight at birth	pounds	72
Average weight at 225 days	"	461·6
Average gain in weight in 225 days	"	389·6
Average gain in weight per day	"	1·7
Average cost per pound gain	cents	6·8
Food consumed per calf—		
Whole milk, 888 pounds at 1·8 cents	$	15 98
Skim-milk, 2,326 pounds at 25 cents		5 81
Bran and oats, 440 pounds at 1 cent		4 40
Mangels, 160 pounds at ·25 cent		40
Total cost for period of 225 days	$	26 59
Second period, 140 days—		
Average weight at beginning	pounds	461·6
Average weight at close	"	618·3
Average gain in weight per period	"	176·7
Average daily gain per calf	"	1·2
Average cost per pound gain	cents	4·4
Food consumed per calf—		
Silage, 1,365 pounds at ·15 cent	$	2 04
Clover hay, 95 pounds at ·5 cent		·475
Green feed, 150 pounds at ·15 cents		·675
Bran and oats, 364 pounds at 1 cent		3 60
Oil cake, 46 pounds at 2·25 cents		1 03
Total cost for period of 140 days	$	7 86
Total cost for 365 days	$	34 45
Total gain for 365 days	pounds	546·3
Average daily gain for 1 year	"	1·5
Cost per pound gain for 1 year	cents	6·3

VEAL CALVES.

Three lots of calves were fed for veal. The ration used was fresh, whole milk. The periods varied from thirty-four to forty-eight days, and the calves used were grade Holstein bulls. Lot 3 contained one calf from a dam that was at least three parts Shorthorn.

Considering the price paid for milk on this market, it does not pay to veal calves on an exclusive whole-milk ration. It will be noticed in the chart below that the most expensive lots were those getting over a gallon and a half for the longer period. The

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Agassiz Dairy Herd in winter exercising Yard. Buildings from left to right :—Sheep-shed, silos, feed-room and granary, main barn and dairy stable.

Interior of Dairy Stable, Agassiz, B.C.

cheapest lot was fed less than a gallon of milk per day, and they were turned off early, although the daily gain was much greater in the two most expensive lots.

The following chart gives the results of the three lots in detail:—

		Lot 1.	Lot 2.	Lot 3.
Average weight at birth	Lbs.	78	82	89
Number of days fed	"	48	35	34
Average gain per period	"	96	74	51
Average daily gain per period	"	2	2·1	1·5
Pounds whole milk fed per period	"	755	540	314
" of milk fed per day, per calf	"	15·7	15·4	9·2
" " for 100 pounds gain	"	786·4	729·7	615·6
Cost of 100 pounds gain, milk at $1.80 per 100 pounds	$	14 15	13 34	11 08

PURE MILK PRODUCTION.

Below are given the results of some bacteriological tests of milk in barn and dairy. We desire here to express our appreciation of the courtesy of Mr. G. H. Unwin, of the Health of Animals Branch here, by whom the bacteriological work was done.

During the months of February, March, and April, 1914,. a number of bacterial counts were made with the milk of the dairy herd. The object of these tests was two-fold:—

(1) To ascertain approximately the quantity of bacteria taken up by milk in the process of handling, from the cow to the consumer's bottle.

(2) To find the relation between the number of bacteria in the air of the barn at milking and the number in the milk.

METHOD OF HANDLING MILK IN BARN AND DAIRY.

The cows are driven in from pasture or yard an hour or more before milking. The ensilage, grain, and roots are fed, and then some time is allowed to pass before milking is begun. All sweeping and hay-feeding is done afterwards. The men milk in white coats and overalls; and after milking each cow the hands are washed at a tap and dried with a paper towel, which is then thrown away. The udder is wiped with a damp cloth. It might be mentioned here that the cows are usually groomed after the morning milking during the winter months. Closed pails are used and the milk, after being weighed, is poured into closed cans. It is then taken to the dairy, a distance of about 60 feet, cooled, strained, and put into bottles. In the dairy all utensils are washed and scalded after using, and then left exposed to air and sunlight. It will be seen that the methods employed are simple, the object being to produce pure milk by means of care and cleanliness, without the use of an elaborate and expensive outfit.

(1) Comparative Tests of Milk from Udder, from Pail, and from Cooler.

Method of Quantitative Testing for Bacteria.—Three samples were taken from each cow. The first was drawn from the teat, the second poured from the milk-pail, the third was run through the cooler, strained, and then dipped into the milk bottle. Sterile bottles were used in each case. The milk thus obtained was plated in the following manner:—

From the sample bottle 1 c.c. of milk was taken with a sterile pipette, and allowed to drop into a bottle containing 200 c.c. of sterile water, where it was well mixed by shaking. Of this dilute mixture, 1 c.c. was drawn out and poured into the

Petri dish. The Agar medium was cooled to about 40 C. and poured into the dish, the whole being then mixed and spread over the plate. The plates were then placed in the incubator at 37°C. and left for forty hours. This is a long incubation period, a fact which should be remembered in considering results. Two plates were used with each sample, to check results. It was found that the dilution used (200: 1) was convenient, the colonies spreading out well and being easily counted. This is the method followed by W. H. Park, N.Y. (*Journal of Hygiene,* July, 1901). The following table shows the results of the first series of tests:—

TABLE "A."

Date.	Number of Cow.	Milk from Teat per c.c.	Milk from Pail, per c.c.	Milk from Cooler, per c.c.
Feb. 17	19	600	2,400	6,600
" 19	24	800	Spreading growth.	3,500
" 20	87	600	3,200	6,000
" 23	2	3,600	5,400	8,200
" 25	3	Sterile.	17,600	30,000
" 26	4	10,000	13,000	16,000
" 27	30	1,000	4,000	9,000
Mar. 4	33	200	3,300	12,000
" 5	31	Sterile.	2 700	6,600
" 7	25	"	1,800	5,200
" 9	18	400	2,600	6,500
" 10	6	800	1,600	4,600
" 15	36	600	Spreading growth.	9,000
" 17	11	2,000	5,800	20,000
" 18	6	3,200	4,200	21,600
Average of counts		1,587	5,154	10,987

With regard to the first column of figures, it may be observed that the milk drawn directly from the udder is not often sterile.

Five counts were discarded, it being clear in these cases that accidental contamination had occurred. Thus on February 24 the milk of No. 29 showed 6,600 per c.c. from the teat, and only 4,000 in each of the samples from pail and cooler. Again, on February 28, No. 13 showed 30,000 in the milk from the teat, and 20,000 in the milk from the pail. The first sample was obviously contaminated from some other source. Such counts as these, where an error was clearly indicated, were therefore discarded. The average of the fifteen counts tabulated gives:—

Milk taken directly from teat contained	per c. c.	1,587
" " pail contained	per c. c.	5,154
" " cooler contained	per c. c.	10,987

Reducing this to a percentage we have the following facts indicated:

Process 1.—Milking	224 per cent increase.
Process 2.—Cooling and straining	113 per cent increase.

The value of these figures is relative. Quantitative tests of bacteria cannot be taken too literally. Yet it will be seen from the table given above that the results are quite uniform, and are to be relied upon as far as they go. They will in any case serve to emphasize the fact that each additional handling of milk greatly increases the risk of contamination, even where clean methods are followed; and consequently, that simplicity and quickness of handling are of prime importance in producing clean milk.

AGASSIZ.

(2) The Air as a Source of Contamination of Milk.

This series of tests was carried on during the month of April. The object, as stated above, was to find approximately the relation between the number of bacteria in the air of the barn and the number in the milk. The weather, for the most part, was sunny and dry, and, as would be expected, the counts were slightly higher than in February and March.

For the air test the method originally devised by Koch was followed. Agar plates were exposed to the air during milking. The period of exposure was three minutes; and the plates were placed upon a milking-stool, which gave about the height of the milk pail. They were exposed as near to the cow and the milker as possible, in order to reproduce the conditions of milking.

With each air test a corresponding test was made of the milk of the whole herd: the sample was taken from the milk which had been cooled, strained, and bottled for the consumer. Check tests were made in every case. Following are the results in tabulated form:—

Date.	Time of Test.	Air Content.	Milk Content.
		Exposure 3 minutes, average of 2 plates.	(40 hrs. incubation.) No. per c.c.
	P.M.		
April 4	5:10	97 (108.86)	29,000
" 6	5:10	69 (78.60)	16,460
" 7	5:15	48 (45.51)	20,060
" 9	5:16	50 (49.51)	13,000
" 11	5:5	99 (94.104)	35,000
" 14	5:0	(1) 276 311.241)	80,000
" 15	5:10	70 (76.64)	12,000
" 16	5:5	37 (36.38)	8,000
" 17	5:0	80 (78.81)	22,000
" 21	5:20	(2) 100 (97.104)	5,000
" 22	5:5	58 (51.65)	9,200
" 23	5:0	104 (107.101)	27,000

(1) On this date hay was being chopped in the barn above and the air was full of dust.
(2) The air plates were exposed after some of the heifers had been turned out. This may account for the high air count, as compared with the milk count.

From the figures it may be seen that the number of bacteria in the air of the barn appears to correspond to a great extent with the number in the milk. Particularly interesting is the test made on April 14, when an abnormal condition of the air existed. Dust-laden air is followed by a correspondingly dirty sample of milk. Excluding this abnormal case, the average of the counts shows:—

Air plate—75 colonies.
Milk plate—19,550 colonies.

Seven of the milk samples contained 20,000 or less per c.c.; of these, six showed a corresponding air count of less than 75. The remaining six show over 20,000 in the milk; and all these have an air count of more than 75. Of the thirteen tests one shows a marked variation (April 24). Considering the numerous other sources of contamination which might cause variations, the results are sufficiently uniform to be convincing. The fact that air is a fertile source of milk contamination is, of course, well established. The figures taken from these tests are useful only in so far as they magnify the danger of such contamination.

Agassiz.

The different organisms observed upon the air plates correspond to many of those found in the milk. Chromogenic forms, green and yellow, were present both in milk and air. A yellow *Staphylococcus*, similar to *St. pyogenes aureus*, was found in both plates. The yellow and white cocci mentioned by Hastings in Research Bulletin 6, Wisconsin Experiment Station, as being very frequently found in the milk of normal healthy cows, were abundant; and a spore bearing bacillus, forming a spreading, arborescent growth, was common to both. This last corresponds in many respects to *Bacillus mesentericus fuscus*. Putrefactive, evil-smelling bacteria were found in air and milk.

CONCLUSIONS.

(1) That quickness and simplicity in methods of handling milk, reduce the risk of contamination.

(2) That air-borne organisms play a great part in milk contamination, and that especial care should be taken to have the air in barns as free from dust as possible.

DAIRY WORK FOR THE YEAR 1913-14.

Since June, 1913, the dairy work has been done by Miss R. Keene. Miss Keene has had considerable experience in dairy work, and particularly in the making of soft cheese, both in England and France. The work in the dairy here has been quite varied in nature, including the handling of the product of the herd, which was marketed in the form of sweet cream, butter, and soft cheese, as well as a small local supply of high-class bottled milk.

In addition, the milk of the individual cows of the herd has been tested regularly throughout the year; also special tests have been made with the pure-bred cows, and a considerable number of samples, sent in by dairymen from the surrounding country, have been tested. All this entails a considerable amount of detailed work. In addition, Miss Keene has acted as judge of dairy products at a number of fall fairs in different parts of the province.

Quite extensive tests have been made with formalin and corrosive sublimate, both alone and combined, as preservatives of milk for Babcock testing. This work was conducted in both summer and winter conditions. Quoting from the protocols of the experiments made, it has been found that a saturated solution of corrosive sublimate and water, used at the rate of ten drops per 8 ounces, will keep milk for one month in good condition for testing. The same amount of commercial formalin, although a perfect preservative for about three weeks, was not as successful for a longer period. A saturated solution of corrosive sublimate in formalin, used at the same rate, gave the best results for both a short and a long period.

Tests were made, extending over a period of 200 days, on the relative acidity of milk produced by cows when fed on different foods. These tests were made with milk kept on the one hand in refrigerators, and on the other in ordinary temperatures. The following rations were fed: Clover pasture, clover as a soiling crop; oats, peas, and vetches as a soiling crop; corn silage in conjunction with pasture; corn silage in conjunction with green feed; corn silage, mangels, mixed grain, and hay; and mangels, mixed grain, and hay. It is a popular argument of the enemies of corn silage that this feed produces a milk which sours rapidly; the trials made with the rations given above show, however, that there is as much variation with one single ration as there is between any two rations.

With the amount of labour expended and with the transportation facilities available, the various marketable products may be considered profitable in the following order: sweet cream, bottled milk, soft cheese, and butter.

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In view of the fact that the making of soft cheese is an important branch of the dairy work here, it is advisable to give in detail some of the experiences during the past year.

CHEESE.

The object aimed at was to produce a ripened soft cheese, approximating as closely as possible, the European original, Coulommier being the particular type chosen to begin with. For this three rooms are desirable (making-, drying-, and curing-rooms). This is not possible here, owing to lack of space, but by utilizing the butter dairy as a making-room, the cheese room was set free for a curing-room.

Though by no means ideal, this arrangement rendered possible the manufacture (in small quantities) of a well-flavoured Coulommier which ripened in from ten to twelve days. The principal difficulty all through has lain in controlling the temperature of the making-room, and the humidity of the curing-room. The temperature of the former varied from 84° in summer to 20° in winter, the proper temperature being from 65° to 68°. As nothing could be done to reduce the heat in this room, during the hottest weather the cheeses were set and ladled at night.

A canvas screen arranged so as to keep the sun off the curing-room during the afternoon improved the conditions there considerably, though even with this addition the temperature was frequently higher than desirable. About the middle of September, it became necessary to heat the making room artificially at night. It was necessary to transfer the cheeses to another room where there is a heater. Here it was possible to control the temperature at will, but the question of humidity arose. The room being very small, some cheeses were too near the heater, causing excessive evaporation. The simplest remedy was to keep these cheeses covered during the earlier stages.

The curing-room at times became too dry; to remedy this the floor was flooded and wet cloths hung up near the cheeses. These were the only means at hand for correcting the conditions, and proved fairly successful.

At the beginning of September, a hardwood draining table was purchased to hold one dozen cheeses. Previous to this, it had been impossible to make more than two cheeses at one time. The straw mats for draining were purchased in England at a cost of 54 cents per dozen.

Experiments to determine the proportions, and rennetting temperature most suitable to the conditions here, show the following to be the best, subject to occasional variations: Fresh morning's milk; rennet at the rate of 3·6 c.c. to 30 pounds milk, starter (acidity ·7 to ·8) at the rate of 9 to 10 c.c. to 30 pounds milk, Rennetting temperature of milk 86°; room temperature 65° to 68°. Some cheeses were tried without starter but were unreliable. They were doubtful under approximately correct conditions (July 27) and became unmarketable where the conditions were bad (July 21).

It may be noted that the cheeses will stand heat better when the percentage of moisture in the atmosphere is low, as here the percentage of moisture is usually high in hot weather. It will be seen that in those which are set with starter (August 18 to November 3), the room temperature may be somewhat raised or lowered without injuring the products, though this variation is not desirable. Cheeses invaded by the liquifying organisms may frequently be saved by exaggerated salting (July 27 and August 4), but this depreciates the product considerably.

Some experiments were made with Pont l'Eveque, but as they need different ripening conditions, it was not possible to do them full justice side by side with Coulommier.

Coulommier sells at 15 cents retail. Pont l'Eveque have not been marketed, but should realize 18 cents to 20 cents each. Cream cheeses have been made of both sweet and acid varieties, but there is little demand for a cheese of this type.

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The total additions to cheesemaking equipment have been: One draining table; four dozen straw mats; three Camembert moulds; six Pont l'Eveque moulds; twelve Coulommier moulds; sundries, such as curd ladles, etc.

Below are the protocols of the trials under different conditions of temperature, etc.

COULOMMIER.

July 24.—5 pounds milk, 9 drops rennet. Milk 86°. Room 78°. Set 11.10 a.m. Ladled 1.50 p.m. Drainage, too rapid on account of heat of room, which varied from 78° to 84°.

July 25.—Temperature dropped to 68°. Cheese began to smell putrid. Destroyed.

COULOMMIER.

July 27.—6 pounds milk, ·75 c.c. rennet. Temperature of milk, 86°. Temperature of room, 72°. Set, 7.20 p.m. Ladled, 10.15 p.m. Turned, 10.35 p.m.

July 28.—Room, 64°. Turned twice before 10.30. Upper mould removed at second turning. Room temperature fell to 62°. Drainage slow, removed to butter dairy where temperature was 64°.

July 29.—Drainage still slow. Turned four times between 6.30 and 7.30. Salted once on each surface and sides. Slight appearance of gasiness on sides.

July 30.—Turned and salted again. Room temperature 74°.

July 31.—Temperature dropped to 61°.

August 1.—Turned. White mould showing. Temperature, 61°. Turned once daily until August 6. Trace of *P. glaucum*. Rest of the cheese covered with white mould.

August 6.—Cheese liquifying under coat. Coat wrinkled.

August 7.—Slightly gassy appearance, but flavour and texture good. Would be no good for shipping, but good for immediate consumption.

COULOMMIER.

August 1.—5½ pounds milk. Rennet, ·7 c.c. Room temperature, 86°. Milk temperature, 72°. Set, 8.20 p.m. Ladled, 10.30 p.m. Turned, 10.45 p.m. Curd not all used; resulting cheese rather thin. No straw mats, muslin placed between cheese and board to prevent curd sticking at first turning.

August 5.—Turned. Temperature, 64°. Temperature rose to 78° and dropped again to 74°.

August 6 and 7.—Turned and salted. (N.B.—This cheese was salted several times where liquifying organisms appeared.) Temperature dropped to 58°, rising to 68° on August 17. Pencillium growing but not freely. Salted again, in one place, salt rubbed in lightly.

August 13.—Ready for use. Flavour and texture good, but too salty.

COULOMMIER (ONE CHEESE).

August. 18.—5½ pounds milk. Rennet ·6 c.c. Starter, 1·5 c.c. Starter added at 10.55 a.m. Room temperature, 68°. Milk temperature, 86°. Ladled, 2.45 p.m. Rennetted, 11.55 a.m. Turned 3.20 p.m., and again the same evening.

August 19.—Turned. Whey fairly clear.

August 20.—Turned, salted top and sides. Removed to cheese room.

August 21.—Turned, salting completed. Room temperature, 72°.

August 22.—Turned.

AGASSIZ.

August 25.—Room temperature, 72°. Progress good.

August 29.—Cheese eaten this and following day. Good texture and flavour. Rapid ripening is accounted for by high room temperature and delay in salting.

COULOMMIER (SIX CHEESES).

November 3.—30 pounds milk. Rennet, 3·6 c.c. Starter, 9 c.c., (acidity ·66). Temperature of room, 68°. Temperature of milk 87°. Starter put in 11.50 a.m. Rennet put in 12.50 p.m. Ladled, 3 p.m. Whey had risen before ladling. Turned 8.30 p.m.

November 4.—Temperature of room had dropped to 56°. Cheese turned twice before 10 a.m. Salted upper surface. Turned in the evening. Room temperature dropped during night to 56°.

November 5.—Drainage continuing. Cheese turned. Demoulded. Salted other surface and sides.

November 6.—Removed to curing room. Ripening normal.

November 14.—Specimens taken to Victoria. Good average cheese.

HORSES.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN, E. S. ARCHIBALD, B.A., B.S.A.

The horses on the Central Experimental Farm have in years previous to 1912 been maintained for labour purposes exclusively. However, in the fiscal year ending March 31, 1913, a small start was made in breeding work. There are now on the Central Experimental Farm twenty-seven horses, made up as follows: 11 heavy draught grade Clydesdale geldings, 6 pure-bred Clydesdale mares, 4 grade Clydesdale mares, 3 expressers, 2 light driving horses, and 1 Clydesdale stallion colt 1 year of age.

HORSE LABOUR.

The twenty-one heavy draught mares and geldings on the Farm are expected to do all the labour not only on the 200-acre farm, but, in addition, must supply the necessary labour to the Horticultural Division, Cereal Division, Poultry Division, Agrostology Division, and Botanical Division. In addition, a large amount of hauling and cartage in connection with all the Divisions, as well as roadmaking, messenger service, and the like, takes up much of their time. Following is a detailed statement of the horse labour for the past fiscal year.

During the year April 1, 1913, to March 31, 1914, the work done by horses kept in the stables was equivalent to 6,889 days' work, distributed as follows:—

	Days.
Live stock, hauling feed, milk delivery, etc.	295
Farm work (200-acre farm)	1,092½
Manure on 200-acre farm	451
Horticultural Division	926
Cereal Division	875
Poultry Division	55
Agrostology Division	39
Bulletins to and from offices	27
Lawns	157
Arboretum	152½
Omnibus service and supervision of work	1,460
Care of roads on farm	403½
Various, including hauling freight, sidewalks, exhibitions, etc., buildings, clearing refuse, hauling materials, etc.	955
Total	6,889

HORSE BREEDING.

There is now at the Central Experimental Farm a good string of breeding mares with which to conduct breeding operations, and the many phases of experimental work both as to breeding, feeding, care, and management of brood mares and foals. Ten uniform, good quality Clydesdale mares are as follows: Four imported Clydesdale mares, two registered Canadian-bred mares; four high quality grade Clydesdale mares.

The imported mares are of particularly high order both as to size, substance, quality, and breeding. These mares are the pick of two of the largest importations of 1913 and contain the choicest blood of the breed. It is hoped that in the course of another year, when breeding operations start on a larger scale, that these mares will be heard from as to the quality of their progeny.

During the past year, two Canadian-bred registered mares gave birth to foals. The first mare to foal had been in the stables of the Central Experimental Farm for a year, and gave birth to a splendid stallion foal. The second mare, also a Canadian-bred registered Clydesdale mare, was purchased three months previous to foaling. This mare had been heavily fed and under-exercised during the winter of 1912-13 and in consequence was overloaded with fat and produced a weak foal which died within twenty-four hours. This is a condition which is altogether too common throughout the farms of Eastern Canada, and a phase of experimental work which will be dealt with both on the Central Experimental Farm and branch Farms and Stations during the coming years.

HORSE STABLES.

The horse stable, constructed in the year 1907, is unaltered since its erection. In view of the fact that there is an increasingly large number of inquiries regarding stable construction, concrete floors and stands, and particularly of ventilation, reference is again made to detailed plans and brief specifications as to this horse barn in the reports for the years 1908 and 1910. In addition to this, readers are referred to a bulletin on farm building ventilation now in the hands of the printers, in which is given details as to the proper method of ventilating the horse barn for all parts of Canada where atmospheric conditions are somewhat similar to those at Ottawa. Based on the results at the Central Experimental Farm, considerable experimental work is being conducted, in the construction of horse barns, on the branch Farms. As to best methods of flooring, lighting, construction of box stalls, and the like, readers of this report are referred to the reports of the Superintendents of the Experimental Stations at Cap Rouge and Ste. Anne de la Pocatière, Que.

FEEDING THE WORK HORSES.

The feeding of the work horses is conducted along the same lines as in former years. However, owing to a large number of inquiries, these methods will bear repetition.

The stableman feeds all horses, and, under his supervision, each teamster is responsible for the washing and cleaning of his horses and harness.

The feeds used are mixed hay, fed long, oats and bran, generally in the proportion of five parts oats to two parts bran, mixed and fed dry. Warm bran mashes, 5 or 6 pounds per horse, are used on Saturday nights to replace the regular grain ration. When horses are on very heavy work, the proportion of bran is decreased to one part for five parts oats. These ratios between bran and oats were decided best after much experimental work. Readers interested are referred to the annual reports of the Dominion Agriculturist, years 1904 and 1905.

A safe standard for feeding draught horses, and one commonly used here, is that of giving from 1 to 1¼ pounds of the above grain mixture and 1 pound of hay for each 100 pounds live weight; this, of course, subject to variation depending on the severity of work, condition of animal when fed, the health of animal, and other minor considerations.

The morning feed, about 5 a.m., consists of about three-eighths of the total grain mixture and one-quarter of the hay for that day. The noon ration is the same. The

evening feed consists of one-quarter of the grain and about one-half of the hay for the day.

Water is supplied after the morning feed and before the noon and evening feeds. During the winter, water is also supplied in the evenings, some three hours after the feed.

With the above treatment, the horses are maintained in good working condition, and with an almost entire absence of common stomach and intestinal ailments, such as indigestion and colic. No condiments are used, but to horses somewhat low in flesh and requiring more feed, molasses mixed with the grain is used in small quantities, as it stimulates the appetite by increasing the palatability of the food.

Experimental work as to the feed value of molasses, and similar lines of work are anticipated.

FEEDING BROOD MARES.

All brood mares are worked up until the day of foaling, care, however, being taken, during the month previous to parturition, that the mares are not overworked, overheated, or worked in shafts or quarters so narrow that it might in any way induce abortion. During the period in which they are carrying their colts they are fed exactly the same as the working geldings and the non-breeding mares. After foaling, the ration of the mare is immediately changed. During the first twenty-four hours after foaling, nothing is given to the brood mare excepting heated drinks and a bran mash, after which she is gradually put on to a good milking ration. A large number of horse breeders lose sight of the fact that the mare suckling the foal must be fed on a milk-producing ration in just the same way as a cow or other classes of stock. A ration which has given us very good success during the past year, for the brood mare suckling the foal, is composed of: oats, four parts; bran, two parts; and cracked corn, two parts. If the mare is slightly down in condition, the ration would be improved by adding one part of oil cake meal, which would not only improve her general condition, but would also increase the milk flow. The quantity of the above ration fed to the mare suckling the colt depends largely upon the condition of the mare, amount of milk which she is giving, and the availability of good pasture. However, even on the best of pasture, a limited amount of meal is very profitable.

FEEDING THE YOUNG COLT.

Since the records in colt feeding on the Central Experimental Farm included only that of one colt for one year, publication of the same would be useless. The principle used, however, was that of teaching the colt to eat grain, composed of crushed oats and bran, as soon as possible. Although a limited amount of pasture was available, yet the colt was taught to eat as soon as he would take it, with the result that within two months he was feeding to advantage from the same ration as the mare, both as to grain and roughage.

As a number of mares on the Central Experimental Farm are in foal, experimental work and data along the lines of cost of feeding will be taken up on a much larger scale during the coming fiscal year, and it is hoped that within a few years a great deal of valuable data will be acquired.

OTTAWA.

FINANCIAL STATEMENT FOR HORSES.

Below are submitted inventories and returns from horses on the Central Experimental Farm during the year April 1, 1913, to March 31, 1914.

	April 1, 1913.		March 31, 1914.		Returns from Labour.	Gross returns including increased value and labour.
	No.	Value.	No.	Value.		
		$		$ cts.	$ cts.	$ cts.
Horses	21	6,925.00	26	9,925.60	4,822.30	7,982.30

RETURNS.

By 6,889 days' labour at 70 cents	$4,822 30	
increased value of horses	3,000 00	
160 tons manure at $1	160 00	
Gross returns		$7,982 30

EXPENDITURES.

To cost of feed and bedding	$2,425 00	
purchases	3,875 00	
shoeing of horses	378 30	
labour, stableman	700 00	
harness and repairs	432 25	
Gross expenditure		7,810 55
Net balance from horses		$171 75

OTTAWA.

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

HORSES.

The horses were kept for labour purposes. A team of grade draught mares was purchased during the year. At present there are six horses at this Station, as follows: three draught mares, one draught horse, one express horse and one carriage horse.

During heavy work they were fed as follows: 13·3 pounds oats and bran, mixed 1 part bran to 5½ parts oats, and 14 pounds hay per 1,000 pounds live weight; and during light work about 10¾ pounds oats and bran, mixed 1 part bran to 4½ parts oats, and 18½ pounds hay per day. Roots were fed as required. The horses have been healthy and are in better condition than ever before.

The team of draught mares purchased during the year was fed for 6 weeks on cheap roughage and bran from February to March 31; it consisted of 30 pounds natural grass hay and bran each per day.

They were given light work and continued in good health; gaining respectively 5 pounds and 10 pounds during the period.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

HORSES.

In the spring of 1913 there were nine horses at this Station, six of which are heavy grades, all being geldings except one. They are used for the general farm work, doing all the heavy work in the different departments, and the miscellaneous trucking.

Three light horses were used for light work, such as express work, cultivating, spraying in gardens and orchards, and driving.

One of these, being badly blemished, was exchanged for a more sound animal later in the season. Another has been used principally for express work for a long time, but is now very old.

The third one, being a very spirited animal, wrenched her fetlock joint, kicking in the stall, and has been laid up for the greater part of the season. Though she is now sufficiently well for use, yet the fetlock joint is much enlarged.

With a view to raising colts, two pure-bred Clydesdale mares have been purchased, one a 3-year-old and the other a 4-year-old. Both are very fine mares, typical of the breed, and should give satisfaction as breeding stock.

EXPERIMENTAL STATION, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT, W. S. BLAIR.

HORSES.

Seven horses are kept. There are three working teams and one driving horse. The work horses were fed as follows: Spring and summer feed, 16 pounds oats, 5 pounds bran; winter feed, 8 pounds oats, 5 pounds bran.

The oats are crushed and mixed with the bran for feeding. They also get 18 to 20 pounds hay per day. Carrots were fed from time to time during the winter.

WORKING OXEN.

From April 1 to November 1, three pair of oxen were kept for breaking new land. These were purchased in the spring and sold in the fall. They were fed 5 pounds crushed oats and 5 pounds cornmeal, with a hay ration of 25 pounds per day.

EXPERIMENTAL STATION, FREDERICTON, N.B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

HORSES.

The teams bought for use on the Farm consist of the following animals: Three pure-bred Clydesdale mares (imported), six grade Clydesdale mares, two grade Percheron mares, two geldings of draught breeding, one driving mare by a standard bred sire out of a Morgan grade mare.

One of the grade Clydesdale mares purchased in 1912 proved in foal and dropped a colt of unknown breeding August 1, 1913. This colt developed well, and was sold in March, 1914.

The above draught horses range in weight from 1,530 pounds to 1,900 pounds, and the driving mare, showing good style and action, stands 16·3 hands high, and weighs 1,150 pounds.

It is intended to breed most of the mares yearly. Last season, six grade Clydesdale and three pure-bred Clydesdale mares and the two grade Percherons were bred, but only one pure-bred Clydesdale, one grade Clydesdale and the two grade Percherons proved pregnant.

All these horses, except one grade Clydesdale mare which had no mate and was used on odd jobs, worked steadily from April 1 to November 30. After that they worked about half time, three teamsters being retained to work the six teams.

They were fed oats, cracked oats, bran, cracked corn, and a little ground oil cake. Some turnips were fed from November till May.

The average daily ration was approximately as follows:—

	Pounds.
Whole oats	12 to 13
Cracked oats	3 to 3·5
Bran	1 to 2
Corn	1 to 1¼
Turnips	5 to 10
Hay	15 to 20

These horses all kept in good flesh. One grade Clydesdale mare was sold during the latter part of March, as there were six teams without her, and a general utility horse was preferred to replace her.

Team labour with driver costs from $4.50 to $5 per day. Based on the smaller cost, with the wages of the teamsters deducted, these six teams earned for the 200 days which they worked, from April 1 to November 30, $3,399.96; and from December 1 to April 1, half time, or 47 days each, $798.96; a total for the year of $4,198.92 One colt selling for $70, the total revenue is $4,268.92.

Their feed bills were as follows:—

Hay, 45 tons at $8	$ 360 00
Oil cake, 1 ton at $20	20 00
Oats, 2,450 bushels at 48 to 55 cents	1,255 25
Corn, 6,200 pounds	106 50
Turnips, 350 bushels at 8 cents	28 00
Bran, 8,000 pounds at $18 per ton	72 00
Straw, 28 tons at $4.50 to $10	168 00
	$2,009 75
Services of mares	80 00
Shoeing	137 40
Stable supplies, veterinary attendance, medicines, etc.	75 00
Six per cent interest on cost price, $5,100	306 00
Ten per cent depreciation	510 00
Gross expenditure	$3,118 15
Profit	1,150 77
	$4,268 92

In the above statement nothing is allowed for the earning of the driving mare nor the odd grade Clydesdale, nor is the manure valued; which all might be placed against the attendance of one stableman, and depreciation of harness, clothing, etc.

HORSE BARN.

In 1913, on the Experimental Station, Fredericton, N.B., a new horse barn was erected, capable of accommodating fifteen horses. The accompanying plans and photographs of this barn are for the most part self-explanatory. A few additional remarks, however, may help make some points more intelligible.

FOUNDATION.

The foundation of this barn is a concrete wall 12 inches in thickness and 2 feet in height, the same resting on a concrete footing 18 inches wide and 18 inches deep.

SUPERSTRUCTURE.

The superstructure is of wood, built on the plank frame type. All timbers throughout this barn in the frame are 2- by 6-inch plank, excepting the joists of the loft floor which are made of 2- by 10-inch planks, and the girths supporting this floor, made of five ply 2- by 10-inch planks. This type of structure is exceedingly strong and is very economical in that it requires less lumber for construction and is more economical in erection than the square-timbered type of barn.

Special attention is drawn to the economic structure of the walls of this barn, which, starting at the outside, are composed of: vertical inch dressed lumber with battens over joints, two ply building paper, 6-inch studs and posts with air space between and, on the inside of stable, one ply of specially prepared building paper (Linofelt), with sheathing on the inside. The ceiling or upper floor is constructed of one ply of rough boards placed diagonally over joists, covered by one ply of building paper and matched lumber, making the same dust-proof, while on the underside the ceiling is sheathed with matched lumber.

DIMENSIONS.

The barn is 89 feet 6 inches in length and 32 feet in width, with a wing 20 feet in width and 26 feet in length. The main barn accommodates fifteen tie stalls, and six box stalls. The wing accommodates feed room, harness room, a stairway, and

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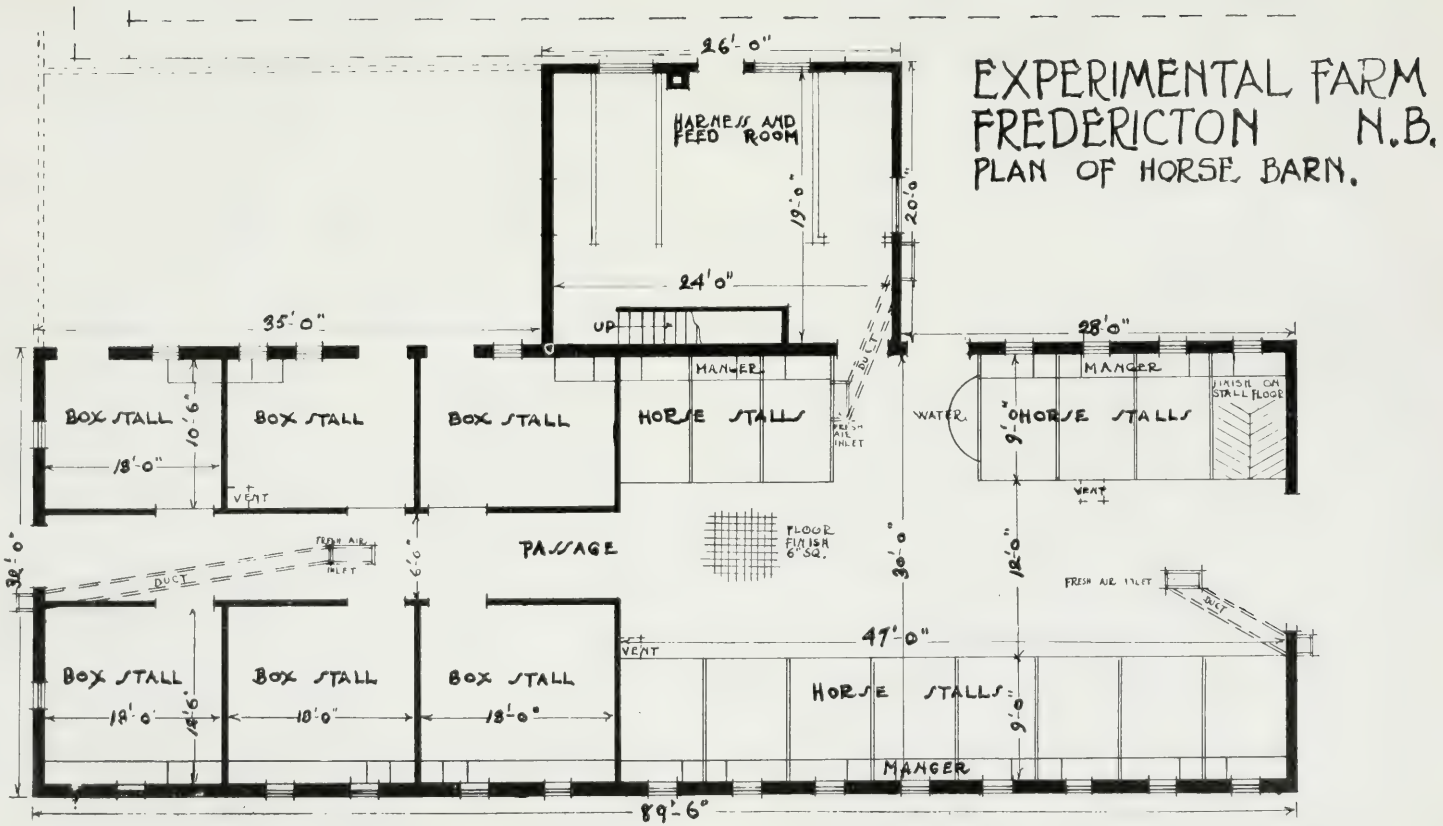
EXPERIMENTAL FARM
FREDERICTON N.B.
PLAN OF HORSE BARN.
26'-0"
HARNESS AND FEED ROOM
19'-0"
20'-0"
24'0"
35'-0"
UP
MANGER
28'0"
MANGER
BOX STALL
BOX STALL
BOX STALL
HORSE STALLS
WATER
HORSE STALLS
FINISH ON STALL FLOOR
10'-6"
18'-0"
VENT
FRESH AIR INLET
9'-0"
VENT
32'-0"
FRESH AIR INLET
DUCT
6'-6"
PASSAGE
FLOOR FINISH 6 SQ.
30'-0"
12'-0"
FRESH AIR INLET
DUCT
47'-0"
VENT
BOX STALL
BOX STALL
BOX STALL
HORSE STALLS
19'-0"
18'-6"
10'-0"
18'-0"
9'-0"
MANGER
89'-6"

Western end of Horse Barn at Experimental Station, Cap Rouge, Que.
Note the lighting, ventilation and conveniences for handling hay and manure.

Interior View of Horse Stable, Cap Rouge, P.Q. Note the fresh air intake covered by grating in floor, and the foul air outlet in ceiling.

meal storage room above. The stalls are 9 feet in length and vary in width from 5 to 6 feet. The box stalls are 10 feet 6 inches by 13 feet. The passage between the two rows of tie-stalls is 12 feet in width.

LEVELS.

The floors throughout are of concrete. All floors are resting on 6 inches or more of field stone, covered by 5 inches of rough cement and 2 inches of finish-coat. The main passage is 5 inches lower than the rear end of the tie-stalls, and is on the same level as feed room and harness room.

SLOPES.

The main passage has a crown of 2 inches to centre. Next the tie-stall is a 1-inch depression to act as a gutter for collecting the urine. The tie stalls have a slope of two inches from front to rear. These tie stalls are finished with a very rough surface and are sloped to centre of stall as well as from front to rear, and also grooved in order to facilitate ease of moving about of occupant and also the carrying away of all liquid manure.

LIGHT.

All light possible was installed in this barn. A window as large as possible was placed in the front of each tie-stall, and all windows possible in doorways, box stalls and feed rooms were installed, in order to give as much light as possible to this building.

VENTILATION.

Fresh air is admitted at the floor level by means of air ducts bringing the fresh air from the intakes just outside the walls. The outlets are three in number, situated to one side of the middle of the barn, when considered from side to side. These run vertically to rafters and follow the line of rafters to cupolas on roof. By the installation of foul-air outlets in this way, there is no interference with the track for hay carriers in loft. The foul-air outlets are constructed of two ply of ⅞-inch matched lumber with a dead air space between, thus giving splendid insulation and preventing condensation of moisture in ventilators. Both incoming fresh air and outgoing foul air are controlled by dampers or keys. It is thus possible to regulate the temperature as desired. This system is known as the Rutherford system of ventilation, and has given the best results on the Central Experimental Farm and branch Farms where tried.

FACILITIES AND FEEDING CONVENIENCES.

Feed chutes, as shown in diagram, extend from the bottom of manger to the plate of barn. Doors to admit the hay into chutes occur at the top and half-way down to the floor of loft. The chute is slightly bell shaped, so that hay once started drops easily to manger. This plan of feeding long hay has been found very satisfactory elsewhere. The manger extends clear across the stall, the hay in chute falling into one end. The grain or meal is fed in the manger, no special box being provided. Horses are watered by men in charge, a water tank at side entrance of barn being conveniently situated for incoming or outgoing horses.

The feed room, although not very large, is sufficient to accommodate the meal trucks necessary. Into this feed room, grain chutes from bins in the meal storage room above empty into movable trucks.

The harness room is conveniently situated, and has facilities for warming should such be necessary. In the harness room are also installed a sink for washing, a tank for heating water on stove, harness racks, and a locker underneath stairway for the keeping of small harness, medicines and the like. The manure is removed from this barn by barrows, there being no overhead track for this purpose.

FREDERICTON.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. A. LANGELIER.

HORSES.

We now have seventeen horses at the Station: 12 registered French Canadians—nine mares, two yearling fillies, one colt—two teams of from 2,600 to 2,900 pounds weight, and a driver of about 1,000 pounds. They have all been, and are now, in very good condition.

During the year, fourteen of these horses, leaving the colts out, worked during 23,190·5 hours as follows:—

	Hours.
Farm work	8,049·5
Care of stock (hauling feed, etc.)	1,392·5
Care of grounds (including roads)	877.
Horticulture	1,222.
Drawing manure	6,050·5
Messenger service	3,306·5
Exhibitions	505.
Draining (hauling tiles, ploughing)	523.
Implements and tools	37·5
Blacksmithing, harness, carriages	39·5
Apiary	25.
Clearing land	2.
Buildings (hauling material)	914.
Fuel (hauling wood and coal)	193·5
Fencing	51.
Waterworks (hauling pipes, etc.)	2.
	23,190·5

EXPERIMENT—WINTERING A HORSE AT LOW COST.

As a great many farmers keep more horses than they can utilize during the winter, it has seemed advisable to try to find a ration which, while of low cost, maintains the animal in good health and leaves him enough energy to perform the spring's work with celerity. In theory, 1 pound of mixed grass, 1 pound of oat straw, and 1 pound of swedes or carrots per 100 pounds of horse, should about maintain the weight of the animal when he is idle. In other words, this is, according to feeding tables, a good maintenance ration. The hay and straw furnish plenty of bulk to distend the digestive tract, whilst the roots cool all the system and add succulence and palatability to the ration.

It is agreeable to note that practice goes hand in hand with theory in this case, as we have tried this ration for three winters with great success. Not only have the animals increased their weight in 1911-12 and 1912-13, but they performed their work all through spring and summer in a way which plainly showed that they were in perfect physical condition. Moreover, one of these animals, a gelding which was subject to frequent attacks of mild colic or bad indigestion, never evidenced the least trouble from this source since he was put through the experiment. A reasonable explanation of this would be that the digestive tract, overworked by the constant high feeding of grain necessary to produce the required energy to do heavy work, gets a much needed rest and is in good shape in the spring.

During the winter of 1913-14, we used a pure-bred French Canadian mare for this experiment. On November 1, 1913, she weighed 1,150 pounds, and on April 1, 1914,

she tipped the scales at 1,135. It is interesting to note, in this connection, that the gelding used in 1911-12 weighed 1,375 in the fall and 1,395 in the spring, and the mare used in 1912-13, tipped the scales at 1,350 in the fall and 1,445 in the spring. This is according to Armsby, who says "experiment has shown that the increase (in the maintenance ration of horses) is not proportional to the weight of the animal, but approximately to the amount of surface which it exposes, so that the large animal requires less food in proportion to its weight to maintain it than does the small one." Jordan also claims that "somewhat larger amounts of protein and carbohydrates are considered necessary with small horses." It must be understood that it is not the intention of the writer to "make a case" in favour of the draught breeds, but it seems opportune at this moment to correct the wrong ideas which most people have about this matter.

In conclusion, it may be said that a farmer who wishes to use this method of feeding must remember that the animal must be gradually taken away from work, in the fall, at the same time as the ration is cut down, whilst in the spring, the ration and work should be gradually increased. At the Station we replaced one-half pound of oats per day, by the same weight both of straw and carrot, whilst the hay from grasses replaced the timothy. In the spring, the reverse is done until the animal is on full feed when work, given gradually at first, is performed during ten hours every day, weather permitting.

That the ration is an economical one can readily be understood when it is said that it cost $10.99 to feed this mare during 150 days, during which time she received 1,725 pounds of hay, valued at $7 per ton, 1,612 pounds of straw at $4, and 1,725 pounds of carrots at $2. The box stall in which she stood was bedded with shavings, and she left during the winter 113 pounds of straw which was weighed and credited to her.

COST OF FEED OF WEANLINGS.

There is not much data on the cost of feed for colts until they are ready to work and earn their living. This has led us to weigh all the feed received by a weanling, with the exception of grass which he ate in a small paddock which was practically bare all the time. It must be remarked that this colt spent all the winter outside, having only a single-boarded shed for a shelter. As the temperature went down to 31° below zero and the animal never even shivered, it can easily be seen that farmers need not be afraid of this way of wintering colts. It is certainly a very good plan if a person wishes to feed heavily, which should be done if any size is to be attained by the animal.

Feed eaten by a colt from birth, May 31, 1913, until April 1, 1914:—

Hay, 816 pounds at $7 per ton	$ 5 71
Oats, 1,018 pounds at 1·5 cent per pound	15 27
Bran, 339·25 pounds at 1 cent per pound	3 39
Wheat, 25 pounds at 1·5 cent per pound	38
Oil cake, 16 pounds at 1·5 cent per pound	24
Skim-milk, 1,260 pounds at ·2 cent per pound	2 52
	$27 51

The sire of this colt does not weigh 1,100 pounds and the dam's average weight for six months (she was weighed once a month), is 1,054 pounds. The colt, on the day when he was 10 months old, weighed 735 pounds, which shows that he will weigh over 1,200 and possibly 1,300 at maturity. He took more feed, to warm his body, because he was wintered outside, but his limbs are in fine shape, which might certainly not have been the case, had he been kept in the stable with such heavy feeding.

It is intended to weigh all feed eaten by this young stallion—a registered French Canadian—until he is 3 years of age; also to do the same with at least one of the foals to be dropped this spring (1914).

CAP ROUGE.

HORSE BARN.

In 1913, on the Experimental Station, Cap Rouge, Que., a new horse barn was erected. This barn is capable of accommodating fifteen horses in ties and also contains eight box stalls. The accompanying photographs, showing the exterior and interior views, will give a good idea regarding the structure of this barn. As the plans and specifications of this building are exactly similar to those of the barn erected on the Experimental Station, Fredericton, N.B., with the exception that there are two more box stalls in this barn, readers are referred to the annual report of that Station for complete plans and specifications. Although this building has, to date, only been used for a few weeks, it has proven most satisfactory and might easily be considered a standard of excellence for horse barns in this province. Already, visitors have inquired as to the details of the building and it is likely that this building, in part at least, will be copied extensively throughout this part of the province of Quebec. Particular attention has been given, in the erection of this building, to the light, ventilation, durability, and conveniences, which can be readily noted from the illustrations.

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIÈRE, QUE.

REPORT OF THE SUPERINTENDENT, JOS. BEGIN.

HORSES.

At present, seven horses are in the stables on this Farm, these being used entirely for labour purposes. Although this number is insufficient for carrying on the work of this Farm, yet owing to the limited stabling facilities previous to the erection of the new horse barn, it was impossible to keep the proper number. This number will be increased from time to time, to which will also be added a number of mares for breeding purposes.

HORSE BARN.

In 1913, on the Experimental Station, Ste. Anne de la Pocatière, Que., a new horse barn was erected, capable of accommodating fifteen horses. The accompanying plans and photographs of this barn are for the most part self-explanatory. A few additional remarks, however, may help make some points more intelligible.

FOUNDATION.

The foundation of this barn is a concrete wall 12 inches in thickness and 2 feet in height, the same resting on a concrete footing 18 inches wide and 18 inches deep.

SUPERSTRUCTURE.

The superstructure is of wood, built of the plank frame type. All timbers throughout this barn in the frame are 2- by 6-inch plank, excepting the joists of the loft floor, which are made of 2- by 10-inch planks, and the girths supporting this floor, made of five ply 2- by 10-inch planks. This type of structure is exceedingly strong and is very economical in that it requires less lumber for construction and is more economical in erection than the square-timbered type of barn.

Special attention is drawn to the economic structure of the walls of this barn, which, starting at the outside, are composed of: vertical inch dressed lumber with battens over joints, two ply building paper, 6-inch studs and posts with air space between and, on the inside of stable, one ply of specially prepared building paper (Linofelt) with sheathing on the inside. The ceiling or upper floor is constructed of one ply of rough boards placed diagonally over joists, covered by one ply of building paper and matched lumber, making the same dust-proof, while on the underside the ceiling is sheathed with matched lumber.

DIMENSIONS.

The barn is 76 feet 6 inches in length and 32 feet in width, with a wing 20 feet in width and 26 feet in length. The main barn accommodates thirteen tie stalls, two box stalls and a carriage shed. The wing accommodates feed room, harness room, stairway, and meal storage room above. The stalls are 9 feet in length and vary in width from 5 to 6 feet. The box stalls are 11 feet 6 inches by 13 feet 6 inches. The drive shed is 18 by 30 feet. The passage between the two rows of tie-stalls is 12 feet in width.

LEVELS.

The floors throughout are of concrete. All floors are resting on 6 inches or more of field stone, covered by 5 inches of rough cement and 2 inches of finish-coat. The main passage is 5 inches lower than the rear end of tie-stalls, and is on the same level as feed room and harness room.

SLOPES.

The main passage has a crown of 2 inches to centre. Next the tie stall is a 1-inch depression to act as a gutter for collecting the urine. The tie stalls have a slope of 2 inches from front to rear. These tie stalls are finished with a very rough surface and are sloped to centre of stall as well as from front to rear, and also grooved in order to facilitate ease of moving about of occupant, and also the carrying away of all liquid manure.

LIGHT.

All light possible was installed in this barn. A window as large as possible was placed in the front of each tie stall, and all windows possible in doorways, box stalls and feed rooms were installed, in order to give as much light as possible to this building.

VENTILATION.

Fresh air is admitted at the floor level by means of air ducts bringing fresh air from the intakes just outside the walls. The outlets are two in number, situated to one side of the middle of the barn when considered from side to side. These run vertically to rafters and follow the line of rafters to cupolas on roof. By the installation of foul air outlets in this way, there is no interference with the track for hay carriers in loft. The foul air outlets are constructed of two ply of $\frac{3}{4}$-inch matched lumber with a dead air space between, thus giving splendid insulation and preventing condensation of moisture in ventilators. Both incoming fresh air and outgoing foul air are controlled by dampers or keys. It is thus possible to regulate the temperature as desired. This system is known as the Rutherford system of ventilation, and has given the best results on the Central Experimental Farm and branch Farms where tried.

FEEDING CONVENIENCES.

Feed chutes, as shown in diagram, extend from the bottom of manger to the plate of barn. Doors to admit the hay into chutes occur at the top and half-way down to the floor of loft. The chute is slightly bell-shaped so that hay once started drops easily to manger. This plan of feeding long hay has been found very sati-factory elsewhere. The manger extends clear across the stall, the hay in chute falling into one end. The grain or meal is fed in the manger, no special box being provided. Horses are watered by men in charge, a water tank at side entrance of barn being conveniently situated for incoming or outgoing horses.

FACILITIES AND CONVENIENCES.

The feed room, although not very large, is sufficient to accommodate the meal trucks necessary. Into this feed room grain chutes from bins in the meal storage room above empty into movable trucks.

The harness room is conveniently situated and has facilities for warming, should such be necessary. In the harness room are also installed a sink for washing, a tank for heating water on stove, harness racks, and a locker underneath stairway for the keeping of small harness, medicines, and the like. The manure is removed from this barn by barrows, there being no overhead track for this purpose.

STE ANNE.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

HORSES.

The horses on this Farm at present consist of the following: twelve heavy farm horses, two light horses for driving, and one 2-year old colt.

The horses are kept for labour purposes; no breeding or experimental work has been done during the year.

CLASSIFICATION OF LABOUR.

The labour performed by the horses during the year was divided as follows: Farm work (regular), 12,150 hours; farm work (experimental) 10,710 hours; horticulture, 640 hours; roads, 750 hours; drawing feed, 630 hours; drawing manure, 1,250 hours; messenger service, 3,120 hours.

HORSE BARN.

A new horse barn has been built this year. It is 72 feet 4 inches long and 32 feet wide, and provides accommodation for fourteen horses tied up in single stalls, and three roomy box stalls.

The single stalls are on each side of a 12-foot main passage which runs lengthwise of the building. The space of two stalls in the middle of the west side is used for the main entrance to the stable. The ends of the building are used for the box stalls and feed room, two box stalls being at the south end and one box stall and the feed room at the north end. This is found to be a very convenient and compact arrangement, and is more economical of space than a driveway through the stable from end to end.

There are no feed passages; the mangers are tight up to the wall, and the hay is fed through chutes which extend from the manger to a height of 7 feet above the loft floor. These chutes are double boarded, with air spaces between the boards, and the doors which open into them are constructed in the same way. They work very satisfactorily, the only difficulty being the swelling of the doors at the top of the chute from the steam which rises from the stable.

The stable is well lighted, a window opens directly into every stall. This gives a bright and cheery appearance and should make it more healthful.

The ventilation is the Rutherford system. There are three fresh-air inlets; each receives the fresh air in a little box placed against the outside wall, with an opening at each side 1 foot square covered by wire netting. From this entrance the air goes through a 1-foot sewer pipe underneath the wall and the cement floor and comes up through a grating placed so as to avoid sending a direct draft against a horse's body. The locations of the ventilator inlets are shown in the accompanying plan. The ventilator outlets consist of two wooden flues which rise from the ceiling of the stable and deliver the foul air through the vents shown on the roof. The flues are of two-ply of matched lumber with an air space between. They are each 2 feet square. The outlet on the roof is wide open to all four directions, and roofed on the top; it has no louvres or other obstacles to impede the ventilation or form a settling place for moisture. The flow of air is regulated by a damper placed in the outlet just above the stable ceiling, and controlled by a rope hanging down in the stable.

This ventilation system has proven very effective. The stable has always been fresh and dry, and almost entirely free from stable smells.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT, T. J. HARRISON, B.S.A.

HORSES.

On the Indian Head Experimental Farm there are at present fourteen horses, viz., three Clydesdale mares, five grade mares, four geldings and two drivers. Among these there are some fine draught horses, but there are also three or four that are past the age of usefulness. This also applies to the two drivers, which are hardly ever used for driving purposes, but are very useful for doing the light farm work. Of the above horses, two grade mares were bought last April to supplement the stock of horses, as there was too much work for the number on hand.

During past years horses were kept on this Farm for labour purposes only, but in the future the breeding of draught horses is also to be carried on. Two mares are now in foal and in due course it is hoped to be able to secure data on the costs of rearing colts, yearlings, 2-year-olds and 3-year-olds. With the purchase of two or three pure-bred Clydesdale mares it should be possible to procure some valuable information in regard to breeding Clydesdales. The breeding of grade draught horses is also to be carried on, the purpose of which is to primarily supply work horses for the Farm. By the use of the pure-bred Clydesdale, the improvement that can be brought about by pure-bred top crosses from a good quality Clydesdale stallion will be noted.

HORSE FEEDING EXPERIMENTS.

With a view to investigating the most economic means of handling and feeding the draught horse in winter an experiment was started last season and will be continued again this winter. The following table will indicate the outline that was followed. It will be noted that horses handled similarly were fed differently, while those fed similarly were handled differently.

Lot	Ration.	Method of Handling.		
		Light Work.	Let Out Each Day.	Stabled and Exercised N.B.
1	Oat straw, oat sheaves, oats, and bran.....	Duke.....	Lucy.....	Flora.
2	Oat straw, mixed hay, oats, and ground flaxseed.....	Jimmie.....	Queen.....	Mary.
3	Oat straw, mixed hay, oats, and bran....	Maggie Ann	Dick.....	Prince
4	Oat straw, alfalfa hay, oats, and bran....	Maggie.....	Kit.....	Dolly.

The horses bracketed under "light work" were worked together, while those bracketed under "stabled and exercised" were handled together in respective two-horse teams. Those under "light work" were worked every second day by the teamster, while the "stabled and exercised" lot were exercised every second day by the stableman. In this way it was possible to work one team of the four each day and exercise one team of the other four. The four horses "let out each day" were, with the exception of two or three very stormy days, turned out in a field every morning where they were allowed to remain most of the day.

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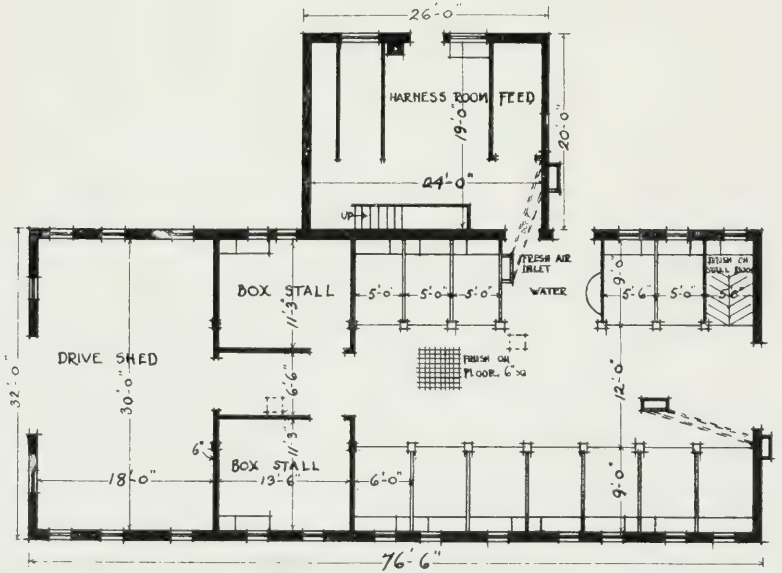
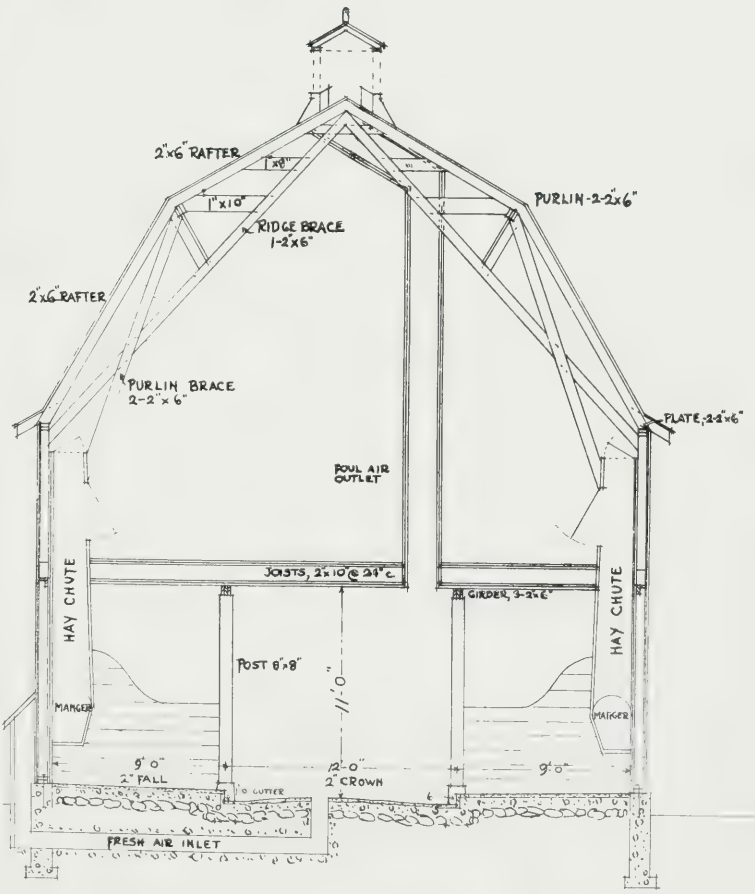
EXPERIMENTAL STATION
ST ANNE DE LA POCATIERE, QUE.

PLAN OF HORSE BARN

1/8 IN SCALE.

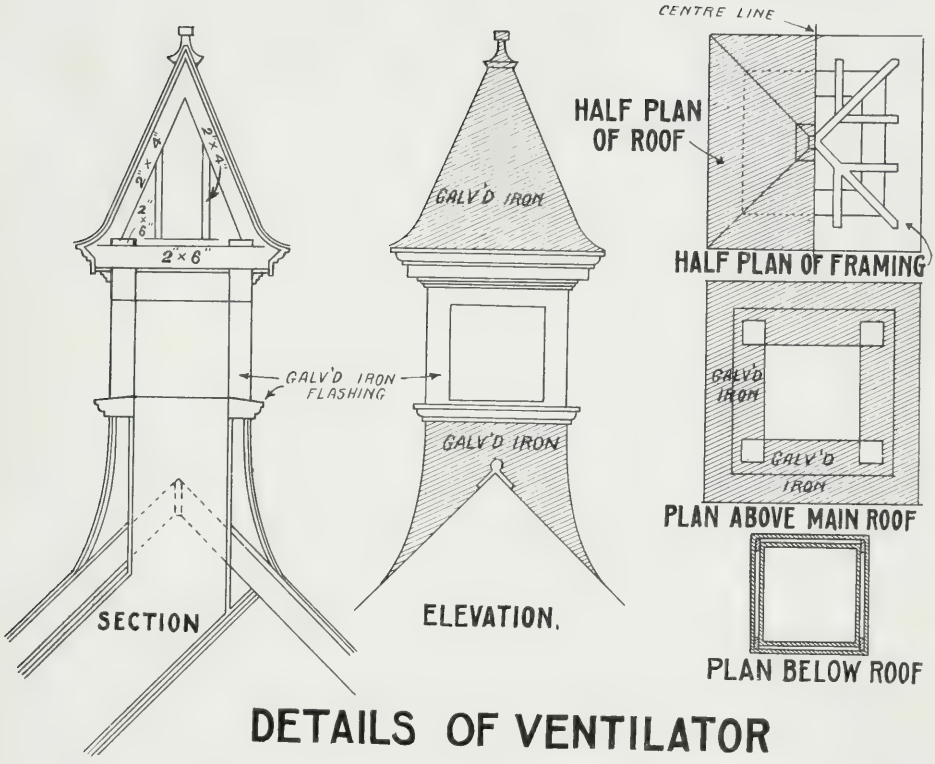


EXPERIMENTAL STATION
STE ANNE DE LA POCATIERE, QUE.
SECTION OF HORSE BARN.
¼ IN SCALE.

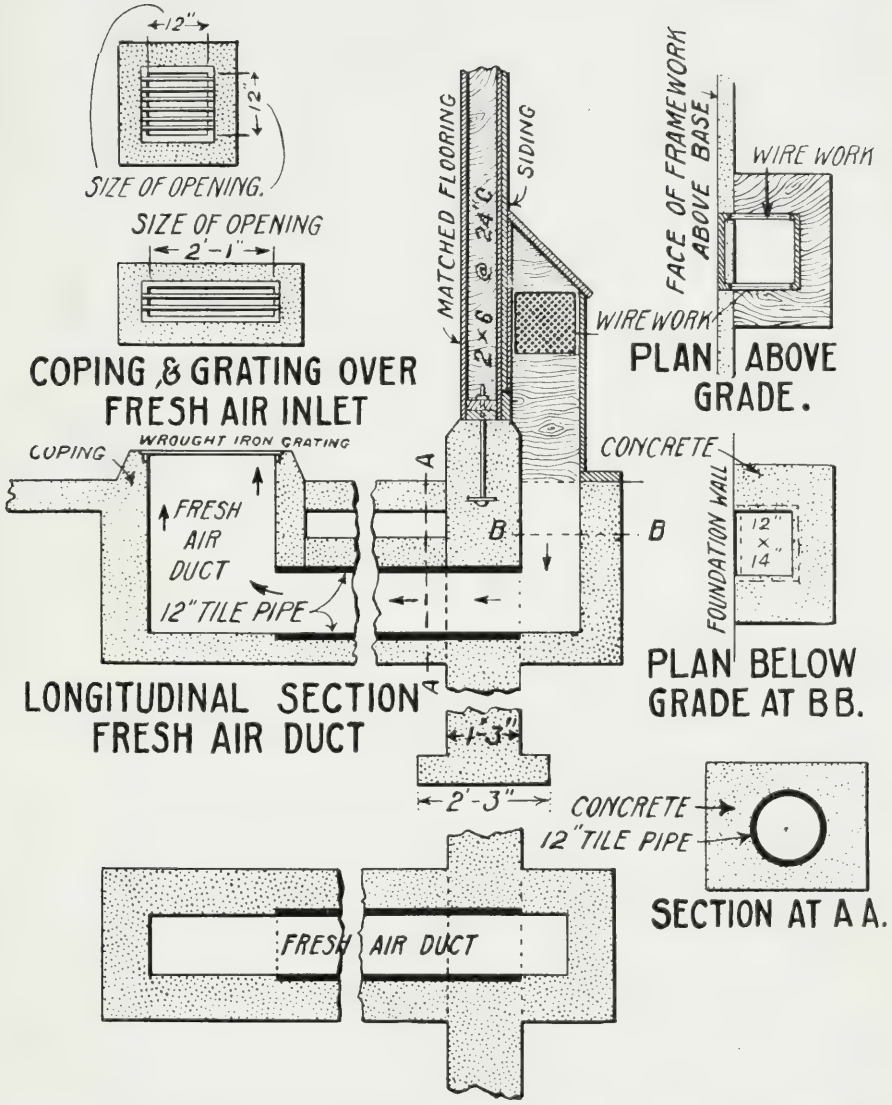


Exterior View of New Horse Stable, Brandon, Man.

PLATE XXXIV.

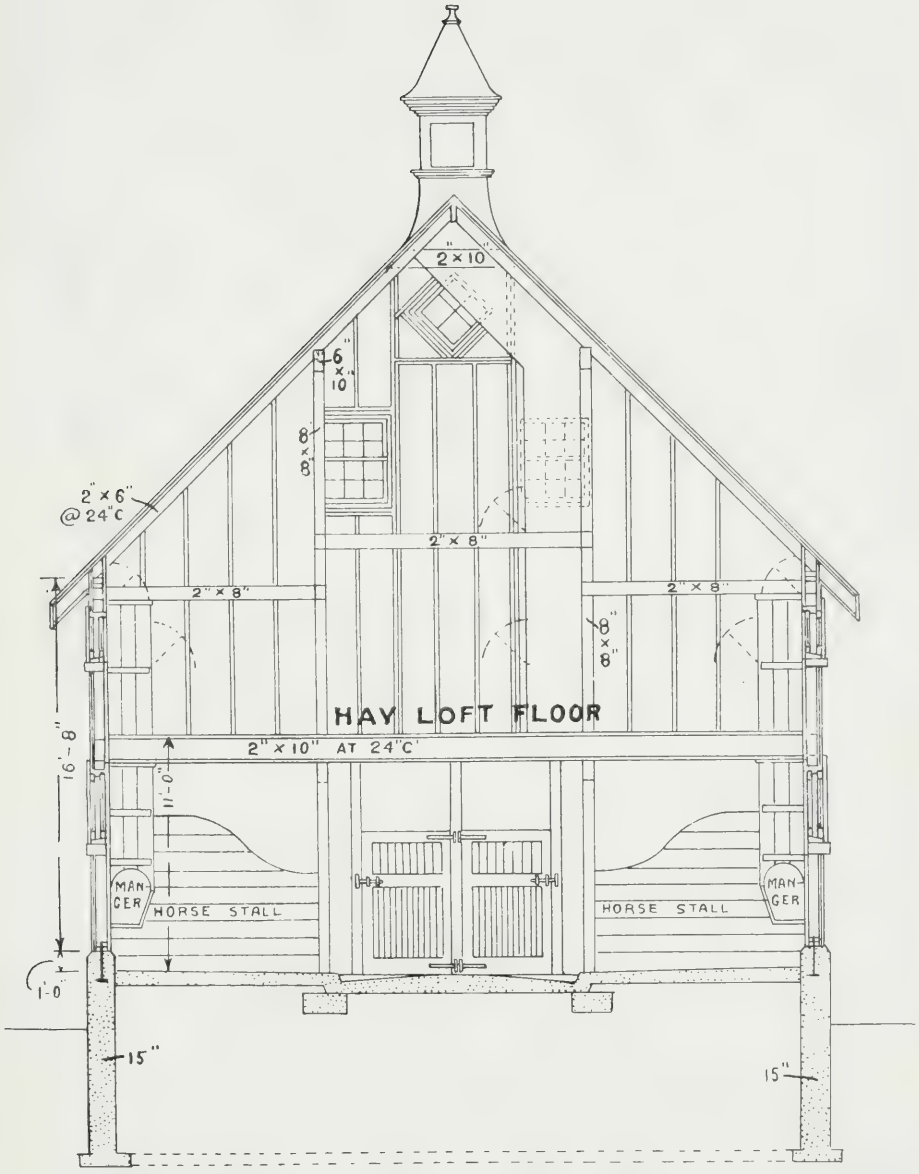


Ventilation of Horse Stable, Brandon (Showing Detail of Ventilator Outlet).



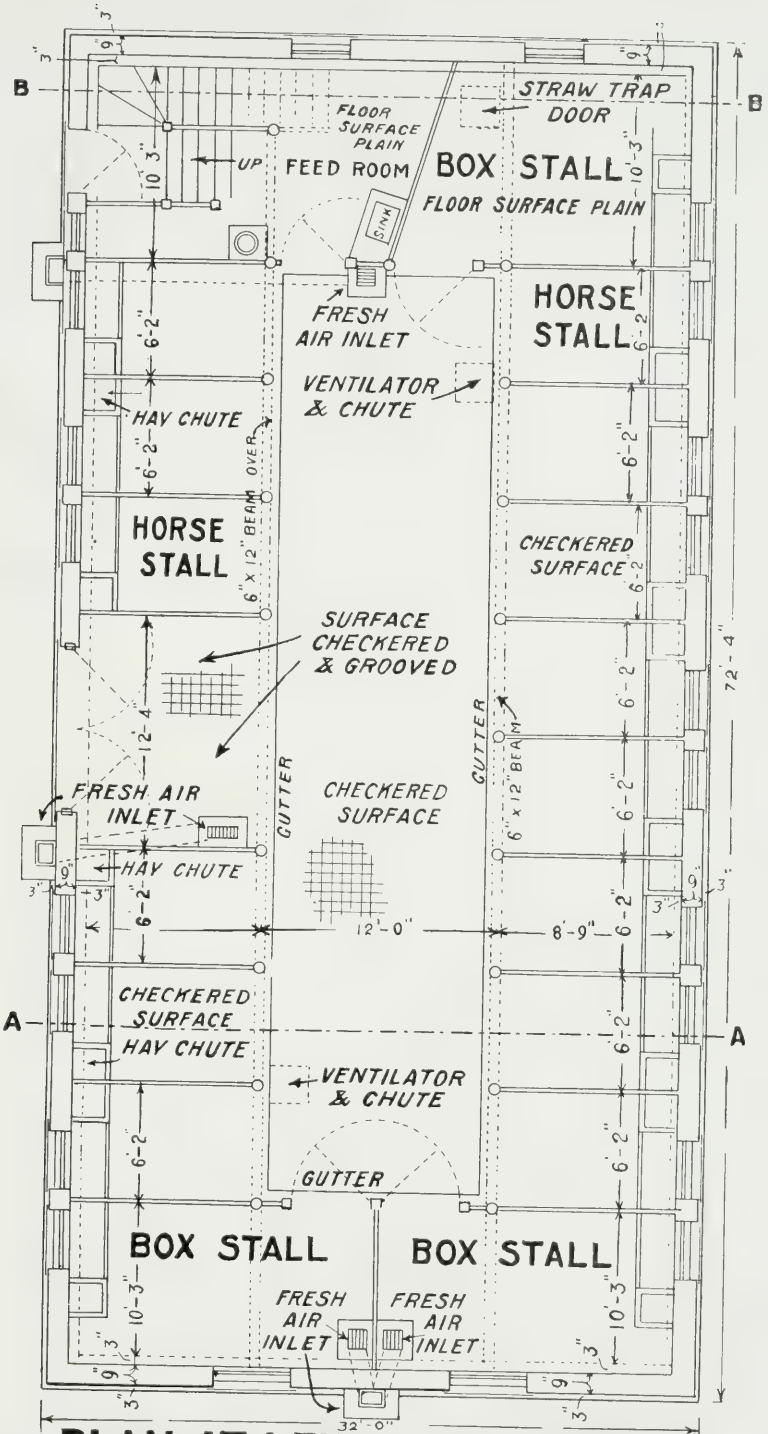
DETAIL OF FRESH AIR INTAKE DUCT.

Ventilation of Horse Stable, Brandon (Showing detail of fresh air intake duct).



CROSS SECTION ON LINE A--A.

Cross Section of Horse Stable, Brandon.



PLAN AT LEVEL OF STABLE

Ground Plan of Horse Stable, Brandon.

Barn and Work Horses, Indian Head, Sask.

The stableman feeds all the horses, while the teamsters, under his supervision, are responsible for the care of their respective teams. The horses are always watered before meals and not after unless to merely wash out their mouths. During the experiment, which lasted for four months, the rations were weighed every week and the horses weighed monthly.

In the feeding of the horse not only the animal's weight but also its individuality was recognized. In the latter connection especially, very noticeable peculiarities were observed, some horses of similar weights being much easier to feed than others. The horse "Duke" is a very hard feeder at any time and particularly did he give evidence of this when fed straw, oat sheaves, oats, and bran. The outline below will give the amount fed the average horse per day. It will be noticed they were all fed lightly in the belief that the idle horse should be limited to about half the feed given when on regular work. Those working, however, were fed according to the nature of the work.

GROUP 1.—STRAW, OAT SHEAVES, OATS, AND BRAN.

Morning.—Oat sheaf.
Noon.—Oats, ½ gallon; bran, ¼ gallon; oat straw, 3 to 5 pounds.
Evening.—Oat sheaf.

NOTE.—In this ration as in the others the horses took a long time to acquire a taste for the straw. Neither did they appreciate the oat sheaves. After a time they thrived on this ration but were never in as good a state of thrift as those fed on the other rations. In the spring, however, after two weeks of good feeding on hay and oats, before the heavy work started, they stood the work as well as the horses in the other groups.

GROUP 2.—STRAW, MIXED HAY, OATS, AND GROUND FLAXSEED.

Morning.—½ gallon oats; ground flaxseed, handful; hay, 3 to 6 pounds.
Noon.—Oats, ½ gallon; ground flaxseed, handful; oat straw, 3 to 5 pounds.
Evening.—Oats, ½ gallon; ground flaxseed, handful; hay, 3 to 6 pounds.

NOTE.—The amount of flaxseed fed in this ration was about one-quarter gallon per day. This ration being more expensive than the former naturally kept the horses up in better condition, but care had to be exercised in giving only a small quantity of flaxseed as it is very laxative in its properties.

GROUP 3.—STRAW, MIXED HAY, OATS, AND BRAN.

Morning.—Oats, ½ gallon; bran, ¼ gallon; hay, 3 to 6 pounds.
Noon.—Oats, ½ gallon; bran, ¼ gallon; oat straw, 3 to 5 pounds.
Evening.—Oats, ½ gallon; bran, ¼ gallon; hay, 3 to 6 pounds.

NOTE.—Of all the rations, this last gave the best satisfaction. The hay seemed to give better results than oat sheaves in No. 1, while the bran is an ideal feed to mix with oats, as contrasted with flax seed in No. 2.

GROUP 4.—STRAW, ALFALFA HAY, OATS, AND BRAN.

Morning.—Oats, ½ gallon; bran, ¼ gallon; alfalfa hay, 2 to 5 pounds.
Noon.—Oats, ½ gallon; bran, ¼ gallon; straw, 3 to 5 pounds.
Evening.—Oats, ½ gallon; bran, ¼ gallon; alfalfa hay, 2 to 5 pounds.

NOTE.—It was found that alfalfa hay is slightly laxative and consequently would not be advisable for drivers or horses at very hard work. It might be used to good advantage with horses at slow, steady work or under such conditions as outlined in the experiment above.

The ration which was found most expensive was that in which the flaxseed was included. That containing the alfalfa hay followed next, while the "oat sheaves" ration came third, and the "mixed hay, oats, and bran" ration cheapest. This may be largely due to the fact that there was less waste with the latter than with the oat sheaves. The prices for feed were allowed as follows: Oat sheaves, 5 cents; oats, 1 cent per pound; flaxseed meal, 4 cents per pound; mixed hay, $10 a ton; alfalfa hay, $12 a ton; oat straw, $2 a ton; bran, $20 a ton.

The average cost per horse was, of course, low in each group, for the reason that they were fed as lightly as possible in consideration of the fact that our aim was the economical feeding. The cost per day per horse was as follows:—

Group 1.—16 cents per horse per day.
" 2.—18 " " "
" 3.—15 " " "
" 4.—17 " " "

The average weight of the horses under this test was 1,600 pounds. With the foregoing method of handling and feeding all horses were carried through the winter in a very satisfactory condition. This work, however, has only just been started, and no definite conclusions can be drawn. It has, however, opened up a very interesting line of investigation that will be followed up in years to come, when more definite data can be published.

EXPERIMENTAL STATION, SCOTT, SASK.

REPORT OF THE SUPERINTENDENT, R. E. EVEREST, B.S.A.

HORSES.

COST OF REARING COLTS.

The cost of raising horses and the cost of wintering idle horses are the two phases of horse investigational work entered upon.

For the purpose of ascertaining figures on the cost of raising horses, the foals of two work mares were taken at weaning time (in this case 5 months of age) and from then a record of feed consumed was kept when stall fed, and of time when animals were on pasture. The following table gives cost of food up to 2 years of age:—

VALUE of Food Consumed.

Oat chop, 2,974 pounds at 34 cents per bushel	$29 74
Hay, 2,832 pounds western rye grass, $10 per ton	14 16
Alfalfa hay, 364 pounds at $12 per ton	2 18
Oat sheaves, 209 at 3 cents each	6 27
Pasture, seven months, two animals at $1 per month	14 00
Total cost	$66 35
Cost of growing one horse from weaning at five months till 2 years of age	33 17½

THE ECONOMIC WINTERING OF IDLE HORSES.

In the work of economy of maintenance of idle horses over winter, five mature work horses were used. These, after a steady summer's work were, on the 2nd of December, started in the following manner: At 7 a.m. they received a drink and a small feed of oat chop in the stable; as soon as this feed was eaten the horses were taken to a prairie pasture field where they remained until 5 p.m., when they were brought to stable, watered, and again given a small feed of oat chop; when occasion required an oat sheaf was also fed. This treatment was given for three months.

The following data give weights of the horses at the beginning of period and conclusion of period, and the value of food consumed:—

Total weight of five horses, December, 1913	lb.	7,432
Average weight, December, 1913	"	1,486
Total weight of horses, March, 1914	"	7,716
Average weight of horses, March, 1914	"	1,543
Total gain in weight	"	284
Average gain in weight	"	57
Value of feed consumed, total	$	45 86
Value of feed consumed, one horse	"	9 17
Cost of maintaining a horse for 120 days, winter of 1913-14	"	9 17

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

HORSES.

The Station now owns twenty head of horses. There are thirteen pure-bred Percheron, Clydesdale, and grade mares. We were successful in raising three foals. Nine of the mares were bred for foaling during the spring and early summer of 1913. Of this number five foaled prematurely, three being, without doubt, cases of abortion and in the other two cases this disease was the probable cause. The mares were wintered outside day and night, had access to a straw stack, were watered at a small lake and were not fed hay or grain. A number were brought up for spring work, were then fed hay and grain, while the others were left out and were fed a light grain ration. Of the six in-foal mares which were worked, only one raised a foal, which was malformed, while all three mares left out raised good colts. It is planned to repeat this test next spring, though all mares are bred to foal comparatively late.

All horses, wintered outside in the manner above described, came through the winter in prime condition and, without exception, showed increase in weight. This method of wintering horses is very inexpensive, costing probably about $1 per month per head. When straw, which would otherwise be burned, can be put to this use, the cost of wintering horses is practically negligible.

Three foals were carried from November 1, to March 31, at a feed cost as follows:—

—	Pounds.	Value per Ton.	Cost.	Combined Weight at 6 Months.
		$	$ cts.	Lb.
Hay	2,718	10	13 59	
Green feed	2,340	10	11 70	
Oats	1,530	20	15 30	
Bran	1,000	20	10 00	
Total			50 59	2,160

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

HORSES.

During the year no experiments have been made with the horses. Ten have been kept for working purposes only. Just at the close of the year, two 3-year-old pure-bred Clydesdale mares were added to the force. These mares are good specimens of the breed, and they are working well at the time of writing. They were both foaled the property of the Colony Farm, Coquitlam, B.C. They are bred as follows:—

Colony Lilly—27871—
{Sire, Brown Spots (imp.)—8383—12877.
{Dam, Lilly of Grandview—15750.

Nellie Dean—28843—
{Sire, Dean Swift (imp.)—5397—12936.
{Dam, Nellie Carrick (imp.)—7375.

The three old light draught horses mentioned in last year's report as being on the downgrade are still retained, and also one general-purpose mare, which is pretty well worn out. In addition to these, there are four grade Clydesdale heavy draught horses, bought in 1912.

Throughout the season all the horses were kept at hard work, and in the winter they were all put on lighter work, but all kept working. They were all fed a mixture of ground oats, peas, and barley, bran, and clover or mixed hay. During the winter they ate about 5 pounds of roots per day. The hay fed averaged at the end of the year slightly less than 1 pound for every 100 pounds live weight.

The average food cost to keep the big horses for the year was:—

Grain, 5,110 pounds at 1.2 cent	$61 32
Hay, 6,570 pounds at .5 cents	32 85
Roots, 510 pounds at .2 cents	1 02
	$95 19

The average food cost of the small horses was less as indicated:—

Grain, 4,380 pounds at 1.2 cent	$52 56
Hay, 5,657 pounds at .5 cents	28 28
Roots, 510 pounds at .2 cents	1 02
	$81 86

Such feeding kept the horses in good condition for the entire year and no trouble from disease of any nature was encountered. One of the old horses was slightly crippled for a time, but this was caused by a combination of hard work and old age. Owing to lack of room no breeding work can be done.

SHEEP.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN, E. S. ARCHIBALD, B.A., B.S.A.

BREEDING SHEEP.

There are now eighty-one pure-bred sheep in the pens. Two breeds only are kept, namely, Shropshires and Leicesters.

The Shropshires include 48 head, made up of 1 ram, 21 aged ewes, 7 shearling ewes, 8 spring ewe lambs, and 11 spring ram lambs.

The Leicesters include 33 head, made up of 1 ram, 11 aged ewes, 8 shearling ewes, 6 spring ewe lambs, and 7 spring ram lambs.

Only a fairly successful year can again be reported in the breeding operations with sheep. The lamb crop in the spring of 1913 was exceptionally good, namely, 151 per cent; and to date, March 31, 1914, has also been very good although many ewes have yet to lamb. During the past fiscal year both ewes and lambs did particularly well until mid-summer. Limited as they were to the 2 acres of pasture contained in the 6-acre sheep rotation, the pasture became very poor after the first month. In past years it has been the practice to allow the sheep to remain on this closely-cropped pasture and supplement the shortage with green crops. This, however, has proved dangerous in that it induced the rapid spreading and multiplying of intestinal parasites. In consequence of our experience in this matter it was deemed advisable to keep the sheep away from this pasture after the grass became closely cropped. An experiment was tried in the keeping of sheep on the Farm roadsides, to ascertain their influence on the keeping clean of roadside as well as the cost of attention for this method of pasturing. Although it proved somewhat more expensive than the other method of pasturing, yet the added weight of the lambs and increased condition of the ewes appeared to warrant the same for these conditions, as long as the Central Experimental Farm is so limited in its land area.

The ewes and lambs, as in former years, were attacked with both tape worms and stomach worms, although only to a small degree. Had they been removed from the 2-acre pasture a few weeks sooner, the probabilities are that the flock would not have become reinfested with these parasites. Treatment was made for these parasites as reported in annual report for 1912, and although it was discovered that but a few individuals were infested, yet these treatments again were quite successful, and are worthy of repetition.

The treatment given for tapeworms, with such good results, was as follows:—

Fast the animals for at least twenty-four hours. Drench mature sheep and shearlings with a mixture of 4 ounces of castor oil and 1 dram (⅛ ounce) of ethereal extract of male fern. Lambs may have one-quarter to three-quarters of the above dose, depending on size and age. Confine sheep for twenty-four hours after drenching. Destroy worms given off in manure

Follow the above drench with a laxative tonic, such as: Common salt, 2 pounds; potassium nitrate, 4 ounces; Epsom Salts, 1 pound; iron sulphate, 8 ounces; powdered gentian, 8 ounces. This mixture is sufficient for 100 mature sheep or 150 to 200 lambs, and also is best given in water solution as a drench.

Apparently very favourable results were obtained in the eradication of stomach worms by the use of a 1 per cent solution of coal tar creosote. Lambs were given 2 to 4 ounces, and mature sheep 3 to 5 ounces, varying with the size. This was administered as a drench, was preceded by a twenty-four hour fast, and succeeded by a twenty-four hour confinement and the laxative tonic as above.

Owing to the winter-killing of all the clovers in the spring of 1913, the after-grass, some of which is usually used for cattle and sheep for pasture, was extremely limited and not of particularly high quality. However, the pasturage on roadsides was so good that at weaning time the lambs were well advanced and after weaning the ewes gained in flesh rapidly previous to mating season in the fall.

All breeding sheep were housed in sheds of a very rough nature during the past winter, as the regular sheep barn and lamb-feeding sheds were completely filled with cattle. Nevertheless, all the breeding stock came through the winter in exceptionally good shape at a minimum of cost.

FEEDING LAMBS.

A special lamb-feeding shed was erected during the summer of 1913 and experimental work on a considerable scale was anticipated. Lambs were purchased subject to delivery on the 20th of October, 1913, and a particularly good bunch of lambs were purchased, at regular market prices, for this feeding experimental work. However, in consequence of the fire, this lamb-feeding shed was the only building available for milch cows until temporary structures could be completed, and was used continuously throughout the past winter for the housing of heifers and bulls. In consequence, the lamb-feeding experimental work was postponed for a year.

LAMB-FEEDING SHED.

Although the inclosed diagrams and photographs are self-explanatory, yet a few details as to a cheap but very efficient shed either for the feeding of lambs or the maintaining of a breeding flock excepting for lambing season, are worthy of mention. This shed was erected on the Central Experimental Farm during the month of July, 1913, and is very satisfactory in all its details.

1. Foundation.

Although originally it was the intention to place the sills of this building on cedar posts, yet it was found nearly as economical to build a low concrete wall for this purpose. This would not be advisable where a farmer anticipates moving the shed from time to time, but where good river gravel and sand are available, it will eventually prove even more economical than post foundations, or the placing of the sills on the earth. This wall also prevents very strong draughts from the northern and western exposures. The foundation wall was made 10 inches in thickness, an average of 2 feet in depth, and was composed of a mixture of concrete, 1 to 6, with as many field stones in the concrete as possible.

2. Superstructure.

The sills and plates and posts were made of 2-inch by 6-inch scantling. Rafters were made of 2-inch by 5-inch scantling, and collar beams of 8-inch boards. The walls were single boarded and battened on the outside of posts and studding, no finish whatever being necessary on the inside. The roof was single boarded and covered with prepared roofing, which to date is proving fairly satisfactory.

OTTAWA.

3. Light.

Special attention was paid to the lighting of this shed, as undoubtedly the great proportion of sheep troubles come from insufficient light, lack of fresh air, and poor ventilation. All windows were hinged at the bottom and fastened at the top with a short chain, thus allowing the window to drop open from the top and allow a free passage of air through the building. The doors also were made 4 feet in width and were so arranged that they can be open at all times except during very severe weather. No ventilation system, aside from the windows and doors, was provided, since both windows and doors are kept open at practically all times.

4. Feed Passage.

The feed passage across the ends of the pens was provided for the ease in feeding of the forages and also, at one end, to provide room for keeping a limited amount of grains in this building. A wood floor was provided for this passage, both from a point of cleanliness and economy of foodstuffs.

5. Pens.

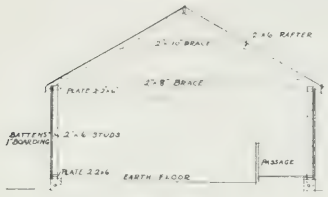
The site of the building was chosen on account of its dryness and good facilities for drainage. Earth floors, for the pens where straw bedding can be used, are considered the best. The doors of pens into paddocks were arranged to eliminate draughts. These doors open to the south, and were made 4 feet in width in order to eliminate the hipping of ewes or the crowding of lambs in the doorway. The sizes of pens were based on the area required for various classes of stock according to the experience with sheep on the Central Experimental Farm. These areas are as follows: For large breeding ewes, 10 to 12 square feet of floor space; smaller breeding ewes, 8 to 10 square feet; feeding and breeding lambs, 5 to 8 square feet. The four pens of this shed will conveniently accommodate twenty-five to thirty feeding lambs each.

6. Feed racks.

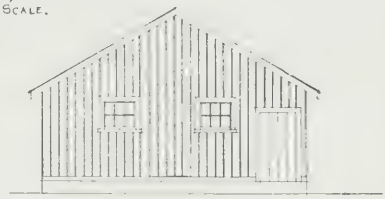
The accompanying diagrams of feed racks installed are self-explanatory. Three different types of hay racks were installed for comparative purposes, type "A" rack including the grain trough in bottom of rack, while the other two types of racks have the grain trough in front of rack. All three types have given good satisfaction in the limited time which they have been used. These and other types of racks and troughs will be installed for comparative purposes, during the coming year.

SHEEP SHED,
CENTRAL EXPERIMENTAL FARM,
OTTAWA, ONT.

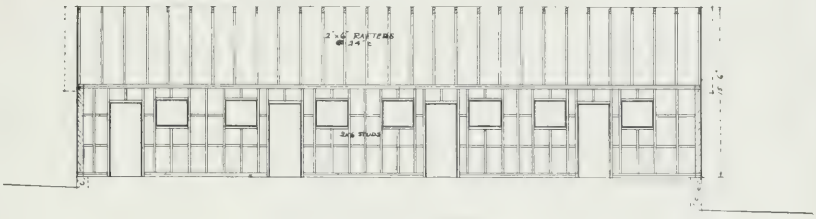
1/4 IN SCALE.



CROSS SECTION.

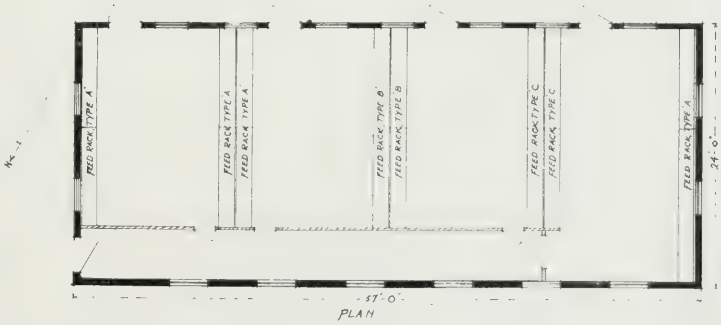


EAST ELEVATION



LONG SECTION, SHEWING FRAMING

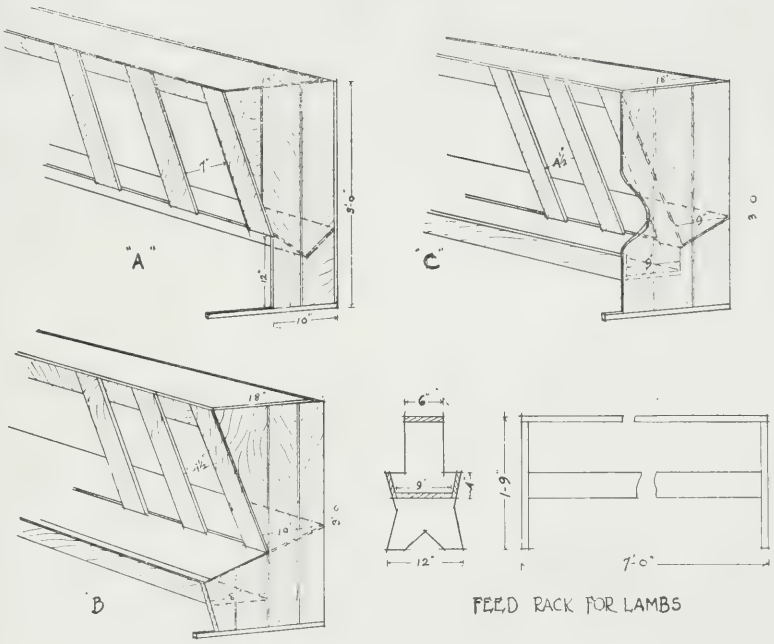
SOUTH ELEVATION



PLAN

DETAIL OF SHEEP RACKS.

- 1½ IN SCALE -



FINANCIAL STATEMENT FOR SHEEP.

Below are submitted inventories and returns for sheep on the Central Experimental Farm during the year April 1, 1913, to March 31, 1914:—

	April 1, 1913.		March 31, 1914.		Returns including sales.	Gross returns made up of increased value and sales.
	No.	Value.	No.	Value.		
		$ cts.		$ cts.	$ cts.	$ cts.
Sheep, all breeds and ages	57	1,028 00	81	1,866 00	267 99	1,077 99

RETURNS

By increase in value of flocks	$ 810 00	
Sales of breeding stock	120 00	
Sales of lamb	6 44	
Sales of wool	71 55	
Manure, 70 tons at $1 per ton	70 00	
Gross returns		$ 1,077 99

EXPENDITURES.

To food consumed	402 15	
Labour expended	345 00	
Purchase of breeders	290 00	
Gross expenditure		1,037 15
Net balance from sheep		40 84

EXPERIMENTAL STATION, CHARLOTTETOWN, P. E. I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

BREEDING SHEEP.

A flock of eight Leicester sheep was transferred from the Nappan Experimental Farm on December 12, 1913. Six other pure-bred Leicester sheep were purchased locally, making a flock of fourteen; consisting of one ram, nine breeding ewes and four ewe lambs. Three of the ewe lambs purchased for breeding purposes proved to be with lamb and were kept over.

The sheep received in December had severe colds in the head which proved very stubborn to treatment. With the ram it developed into catarrhal pneumonia and killed him.

EXPERIMENT IN FATTENING LAMBS.

The experiment to determine the relative value of roughage in lamb fattening was continued with four pens of nine lambs each.

The total number of lambs in the experiment was thirty-six. The original cost was very high being $5.90 per cwt. live weight. Wether and ewe lambs were selected, weighing on the average 87 pounds for three pens and 70 pounds for the fourth.

The lambs were allowed to run on pasture for a short time before the beginning of the test.

After this preparatory period they were fed as follows: Each lot received 2¼ pounds of meal mixture per diem and 1 pound of bran at starting. The meal mixture was increased by one tenth of a pound per diem, throughout the experiment. The bran was increased as necessary up to 2½ pounds per diem, the average amount of bran fed being about 2 pounds per diem.

Pen IV, though lighter in weight, received the same amount of meal and bran per diem until January 23. From that time on they received a 10 per cent increase of the meal mixture.

The roughage fed the different lots was as follows:—

Lot I received alfalfa and clover hay of fair quality.
Lot II was fed mixed clover and timothy hay, and corn stover in the proportion of 2 of hay and 1 of corn stover.
Lot III was fed timothy hay and mangels.
Lot IV was fed mixed clover and timothy hay and mangels.

The lambs were dipped with Cooper's dip for lice and ticks on December 22. This set them back for a time.

In calculating the cost of feeding the following prices were charged:—

Roots and corn stover at $2 per ton.
Hay at $5 per ton.
Meal mixture and bran at $25 per ton.

LAMB FEEDING EXPERIMENT.—(Clover hay, largely alfalfa, *vs.* mixed hay, and corn stover *vs.* timothy hay and roots *vs.* mixed hay and roots and extra grain).

Lot :		I.	II.	III.	IV.
Class of feed for lot.		Clover hay, considerable alfalfa.	Mixed hay and corn stover.	Timothy hay and roots.	Mixed hay and roots and extra grain.
Number of lambs in lot		9	9	9	9
Number of days in experiment		97	97	97	97
Total weight at beginning	lb.	787½	784½	789	648½
Total weight at end	"	862	838	822	741½
Gain during period	"	74½	53½	33	93
Gain per head	"	8·3	5·94	3·66	10·3
Gain per head per day	"	·085	·065	·037	·106
Quantity of meal eaten by lot	"	815	815	809	861
Quantity of clover hay eaten	"	1,898	.....	.....	.....
Quantity of mixed hay eaten	"	.....	1,377	.....	1 091
Quantity of timothy hay eaten	"	.....	.....	1,377	.....
Quantity of roots and ensilage eaten	"	.....	703	841	864
Total cost of feed	$	16·82	15·70	15·77	15·42
Cost of feed per head	"	1·89	1 74	1·75	1·71
Cost of feed per head per day	Cts.	1·94	1·8	1·80	1·76
Original cost of lambs at $5.93 per 100 pounds, live weight	$	46·70	46·52	46·79	38·45
Original cost of lambs plus cost of feed	$	63·52	62·22	62·56	53·87
Selling price at 7½ cents per pound	$	64·65	62 85	61·65	55·71
Net profit on lot	$	1·13	·63	*·91	1·84
Net profit on lamb	cts.	·12	·7	·10	·20
Cost to produce 1 pound gain	"	22·7	29·6	47·7	16·6

* Loss.

LAMB FATTENING EXPERIMENT.—(Average results of three years' test of alfalfa hay *vs.* mixed hay, and corn stover *vs.* timothy hay and roots as roughage in fattening lambs).

LOT.		I.	II.	III.
Class of Feed.		Alfalfa Hay.	Mixed Hay and Corn Stover.	Timothy Hay and Roots.
Number of lambs in group		31	31	31
Average number of days in experiment		92	92	92
Total weight at beginning of experiment	lb.	2,529¼	2,519½	2,462
Total weight at end of experiment	"	2,872⅓	2,674¼	2,655⅜
Gain during period	"	342¼	155	193⅜
Gain per head	"	11	5	6.2
Gain per head per day	"	2	.054	.068
Quantity of grain eaten by lot in period	"	2,126	2,003⅓	1,891⅓
Quantity of alfalfa	"	6,717	.....	.....
Quantity of timothy	"	.....	.....	4,194
Quantity of mixed hay	"	.....	4,141	.....
Quantity of roots and ensilage	"	.....	3,826	4,147⅓
Total cost of feed	$	50.07	43.34	42.47
Cost of feed per head	$	1.61	1.39	1.37
Cost of feed per head per day	cts.	1.75	1.51	1.49
Original cost of lambs	$	125.08	124.67	12,207
Original cost of lambs, plus cost of feed	$	175.15	168.01	154.54
Selling price	$	187.75	175.29	165.39
Net profit on lot	$	12.60	7.28	.84
Net profit on lamb	cts.	40	23	02
Cost to produce a pound of gain	cts.	14⅓	28	22

LAMB FEEDING EXPERIMENTS.—Table 1 Weights and Gains.

Ear Number	First Weight.	Last Weight.	Total Gain.	Dressed Weight.	Percentage of Dressed Meat.
	Lb.	Lb.	Lb.	Lb.	%
Pen No. 1—No. 1	89·5	98	8·5	49	50
" 2	79	86	13	41	47·7
" 11	88	97	9	46	47·4
" 22	95	107	12	59	55·1
" 28	86	93	7	47	50·5
" 34	80·5	86	5·5	39	45·35
" 36	77	88	*11	44	50
" 37	112·5	112	*·5	53	48·2
" 39	80	95	15	47	49·5
Total	787½	862	74·5	425	
Pen No. 2—No. 3	75·5	82	6·5	40	48·78
" 4	77	82	5	38	46·3
" 5	93	98	5	50	51
" 6	76·5	84	7·5	40	47·8
" 8	78	88	10	42	47·7
" 10	112	114	2	53	46·5
" 14	90	89	*1	43	48·3
" 18	87	97	10	49	50·5
" 23	95·5	104	8·5	55	52·88
Total	784·5	838	53·5	410	
Pen No. 3—No. 9	98	102	4	53	51·96
" 12	81	78	*3	40	51·3
" 15	86	84	*2	41	48·8
" 25	76	79	3	40	50·63
" 29	100	92	*8	47	51·1
" 31	79·5	82	2·5	44	53·66
" 32	92	105	13	56	53·1
" 35	85	93	8	47	50·5
" 38	91·5	107	15.5	53	49·53
Total	789	822	33	421	
Pen No. 4—No. 7	72·5	88·5	16	40	45·2
" 16	71	79	8	37	46·8
" 17	70	83·5	13·5	43	50·3
" 19	67	74·5	6·5	31	41·6
" 20	70	83	13	37	44·6
" 21	71	83	12	38	45·8
" 27	69	82·5	13·5	41	49·7
" 28	70	86·5	16·5	36	41·6
" 33	88	81	*7	34	42
Total	648·5	741·5	93	337	

The last weight was taken after the lambs had been starved sixteen hours.

The demand for lambs carried over winter is much greater than the supply. Lambs of medium weight make the best gains and are most profitable for winter feeding.

Good clover hay with roots and grain has been found most satisfactory. The quantity of grain at the commencement of the feeding period should be small. The increase should be gradual.

CHARLOTTETOWN.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

SHEEP.

BREEDING FLOCK.

Owing to the fact that we were handicapped for pasture and stable room, it was thought best to discontinue for the present the practice of keeping more than one breed of sheep at this Farm. Hence, in the fall of 1913, the flock of Leicesters was shipped to the Experimental Station, Charlottetown, P.E.I., and the Shropshires retained, as they were considered the more suitable breed for this district. As part of this flock was getting somewhat aged, and others not of desirable type, it was decided to dispose of them and purchase a younger and more typical foundation flock.

This was done in December, 1913, when there were purchased nine ewes, consisting of one two-shear, two shearlings and six lambs, all of which were from well-bred stock, in fact, prize winners. These are very uniform and typical of the breed, and especially is this true of the six lambs, which have made excellent development during the winter.

Three only were bred, namely, the two-shear and the two shearlings. We were very unfortunate in losing one shearling ewe on February 23, 1914. Death was caused by wool-ball in paunch. The other two gave three very nice lambs, two ewes and a ram.

The ram that heads the flock is a very typical sire, "Kelsey's Promise."

All record of feed, etc., is being kept of this flock in order to demonstrate the profit to be derived from such. Naturally it may be expected that the first year is the most expensive one, more especially where the greater percentage of the flock is lambs which do not give any return except the wool and manure. Following is the method of feeding and foodstuffs consumed during the remaining part of the year:—

From December 20 to March 5 they received 1½ pounds hay, 6 pounds pulped roots, and ¾ pound whole oats, per head per day.

From March 5 to April 1 they received 1½ pounds hay, 3 pounds whole roots, ¾ pound crushed oats.

The following table gives the total amounts of each and cost of feed:—

BREEDING SHEEP.—Value of food stuffs was: Hay, $8 per ton; meal, $1.38 per cwt.; and roots and ensilage, $2 per ton.

No. of Sheep.	Period.	Hay.	Roots and Ensilage.	Meal.	Cost of Feed.
		Lb.	Lb.	Lb.	$ cts.
10	Dec. 20, 1913, to Feb. 23, 1914	975	3,900	487·5	14 53
9	Feb. 23, 1914, to Mar. 5, 1914	135	540	67·5	2 01
9	Mar. 5, 1914, to Apr. 1, 1914	351	702	58·5	2 91
9	101 days	1,461	5,142	613·5	19 45

FINANCIAL STATEMENT.

Breed.	Dec., 1913.		Apr., 1914.		Return.	Gross returns made up of increase in value and returns from wool.
	No.	Value.	No.	Value.		
		$ cts.		$ cts.	$ cts.	$ cts.
Shropshires of all ages.....	10	230 00	12	278 00	18 46	66 46

RETURNS.

Made up in increase in value and returns from wool.....	$66 46
6½ tons manure at $1 per ton.....	6 75
	$73 21

EXPENDITURES AND LOSSES.

Food consumed	$19 45
Labour	30 30
Loss of one ewe	25 00
	$74 75
Net balance	$1 84

LAMB FEEDING EXPERIMENT.

In order to get more conclusive data on the relative value of clover and timothy hay in fattening lambs, a similar experiment to that of 1912-13 was carried on during the winter of 1913-14.

Of the fifty-six grade lambs purchased for this test, all were wethers except ten. These were divided into four lots of fourteen each. Lots 1 and 2 were the heaviest, lots 3 and 4 the lightest, but all fairly uniform. Lot 1 was fed clover hay, roots, and meal; lot 2, clover hay and meal; lot 3, timothy hay, roots, and meal; and lot 4, timothy hay and meal.

The meal ration was fed alike to all lots throughout the test and at the start they received three-quarters pound per head per day. This was gradually increased until at the end of the period they were receiving 1¾ pounds. Each lamb in lots 2 and 3 received 2½ pounds at the beginning and increased to 4 pounds of pulped roots per lamb per day. Lots 2 and 4 did not receive any roots. Lots 1 and 2 were fed clover hay at the rate of 1½ pounds per lamb per day. Lots 3 and 4 were fed timothy hay at the rate of 1½ pounds per lamb per day.

The meal ration was made up as follows: Bran, 200 pounds; mixed crushed grain, (oats and barley) 200 pounds, cotton seed (100 pounds) at the first of period, then replaced by oil cake (100 pounds).

The cost of different feeds was figured at: Hay, $8 per ton; meal mixture, $1.30 per cwt.; roots, $2 per ton.

The following table gives the results of the test:—

LAMB FEEDING EXPERIMENT at Nappan Experimental Farm, 1913.

	Lot 1.	Lot 2.	Lot 3.	Lot 4.
	Clover Hay Roots and Meal.	Clover Hay and Meal.	Timothy Hay Roots and Meal.	Timothy Hay and Meal.
No. of lambs in lot	14	13	14	12
No. of days in experiment	118	118	118	118
Total weight at beginning of experiment lb.	1,299	1,221	1,199	917·5
Total weight at finish of experiment "	1,634	1,488	1,518	1,151
Gain during period "	335	267·5	319	233·5
Gain per head "	23·9	20·5	22·7	19·4
Gain per head per day "	·20	·17	·19	·16
Quantity of hay consumed "	2,478	2,301	2,478	2,124
Quantity of meal consumed "	2,089·50	1,940 25	2,089·50	1,791
Quantity of roots consumed "	6,608	.....	6,608	.....
Total cost of feed $	43·68	34 43	43·68	31·78
Cost of feed per head "	3·12	2·65	3 12	2·65
Cost of feed per head per day cts.	2·64	2·24	2·64	2·24
Cost of 1 pound gain "	13·04	12 89	13·69	13·60
Original cost of sheep $	76·49	71·89	70·60	54·02
Original cost of sheep plus cost of feed "	120·17	106·32	114·28	85·80
Selling price at $8 per hundred pounds. "	130·72	119·04	121·44	92·08
Net profit on lot "	10·55	12·72	7·16	6·28
Net profit per lamb "	·75	·98	·51	·52

AVERAGE Two Years' Lamb Feeding Experiment at Nappan Experimental Farm.

	Lot 1.	Lot 2.	Lot 3.	Lot 4.
	Clover Hay, Roots and Meal.	Clover Hay, and Meal.	Timothy Hay, Roots and Meal.	Timothy Hay, and Meal.
Number of lambs in lot	12	11.5	12	11
Number of days in experiment	97	97	97	97
Total weight at beginning of experiment lb	1,009.5	970.5	960.5	816.25
Total weight at finish of experiment "	1,294.5	1,208	1,237.5	1,029
Gain during period "	285.0	237	277.0	212.75
Gain per head "	23.75	20.65	23.08	19.54
Gain per head per day "	.24	.21	.24	.20
Quantity of hay consumed "	1,809	1,720.5	1,809	1,632
Quantity of meal consumed "	1,509.75	1,435.125	1,509.75	1,360.5
Quantity of roots consumed "	4,704	.....	4,704	.....
Total cost of feed $	32 50	26.48	32.50	25.15
Cost of feed per head "	2.71	2.30	2.71	2.29
Cost of feed per head per day cts	2.79	2.37	2.79	2.35
Cost of 1 pound gain "	11.4	11.15	11.7	11.82
Original cost of sheep $	56.25	53.95	53.35	44.89
Original cost of sheep plus cost of feed "	88.75	80.43	85.85	70.04
Selling price at $7.50 and $8 per hundred pounds. "	101.18	94.32	96.61	80.06
Net profit on lot "	12.43	13.89	10.76	10.02
Net profit per lamb "	1.04	1.21	.90	.91

DEDUCTIONS.

While no positive deductions can be drawn even from two years results, yet, when we have compared the results of 1912-13 with those of 1913-14 and find they coincide as well as they do, we are most apt to lay considerable stress on such results. Hence the following points may be of great interest to note:—

First: That 1912-13 test showed that clover hay surpassed timothy hay in economy of production likewise this test.

Second: That when timothy is fed, roots play a great part in the feed ration.

Third: That in both cases, clover hay and meal have given greatest profit.

Fourth: Both 1912-13 and 1913-14 tests have shown quite conclusively that a good profit can be realized over and above the market value of food stuffs in fattening lambs.

Fifth: Note that when roots are used a better daily gain is obtained but not quite sufficient to produce any appreciable profit by using them.

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Brandon : Sheep-wintering Experiment. This illustrates the cheap shed used in this experiment.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. A. LANGELIER.

SHEEP.

A small but select flock of Leicesters is kept, consisting of one ram, six breeding ewes, and eight ewe lambs. Four ram lambs, sold during the autumn of 1913 to the Provincial Government, made an average of over $40 each at the public sale held in Quebec during October of that year.

A good dog-proof fence was made around the sheep pasture and as this pasture is on a high knoll and very dry it had to be supplemented with green peas and oats. A creep was made to allow grain feeding to the lambs, and the stock kept in fine shape until the end of March, when this report is written.

The ram, instead of being turned in with the ewes to serve them, was kept in a separate paddock in which grain was fed to the ewes once a day, when the man who fed could watch them and take note of the ear number of the ewe served. This method not only has the advantage of saving the ram's energy, but also of giving positive and correct information as to the date of lambing, when the ewes can be watched carefully.

During the winter of 1913, the horses had to be kept in the future sheep barn, pending the completion of a new stable. This prevented doing any feeding experiment through lack of room.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

SHEEP.

The flock is comprised as follows on March 31, 1914: One Oxford Down ram; three Oxford Down ewes (two aged and one yearling); forty-six grade ewes (twenty-three aged, eighteen yearlings and five lambs).

In 1910 and 1911 a start was made at sheep raising here, by obtaining a small flock of grade ewes. These ewes were part of a shipment brought by the Manitoba Sheep Breeders' Association from the range districts of western Saskatchewan. They were of the usual range type, though rather better than the average, and were of decidedly mixed breeding and appearance. These ewes have improved greatly in appearance under farm treatment and good feeding. They have been bred each season to a pure-bred Oxford Down ram, and a noticeable improvement is being observed in the progeny, as illustrated in the accompanying plate.

The season of 1913 was not a particularly successful one for the raising of lambs. The lambs raised averaged about .75 to the ewe, and more than two-thirds of these were rams, so that the increase of females to the flock was only five.

EXPERIMENT IN WINTERING BREEDING FLOCK.

An experiment was tried this winter in which alfalfa was compared with mixed hay, consisting chiefly of timothy and Western Rye grass, as a feed for breeding ewes, and also in which an expensive sheep barn was compared with a cheap open shed as a place for wintering these ewes.

The flock was divided as equally as possible into three lots. Two lots were housed in the sheep barn, were each given a small yard in which to run, were only confined in the barn on stormy days, and were always fed inside. The other lot were given an open shed for shelter and were fed entirely out-of-doors. Of the two lots in the sheep barn, one was fed mixed hay and the other alfalfa; the outside lot received alfalfa. All three lots received straw in equal quantities per sheep once a day and were fed a small ration (one-quarter pound per sheep per day) of peas and oats. The hay and the alfalfa were fed in equal quantities per sheep to all lots.

The results are reported in tabular form as follows:—

	Lot 1.	Lot 2.	Lot 3.
	Open Shed. Fed alfalfa.	Sheep Barn. Fed alfalfa.	Sheep Barn. Fed hay.
No. of lot	16	16	17
Total weight on January 9 lb.	2,340	2,625	2,300
Total weight on March 31 "	2,770	2,574	2,675
Total gain in 81 days "	430	439	375
Average gain per sheep "	26.88	27.42	22.06
Pounds of mixed hay used "			6,024
Pounds of alfalfa used "	5,670	5,670	
Pounds of straw used "	1,620	1,620	1,731
Pounds of grain used "	324	324	364

It will be observed that the sheep that received alfalfa wintered better than hay-fed sheep. This was shown in their general appearance, as well as in their weight.

The sheep that were fed in the open shed did practically as well by weight as the lot receiving the same feed inside. In general appearance they looked healthier and more vigorous than either of the other lots. (Note in plates the two buildings referred to in this experiment.)

The ewes had not commenced to lamb at the end of the fiscal year; it is therefore impossible to report on the lamb crop resulting from the different treatments. Notes will be taken on this aspect of the question and the results reported next year.

No experiments in the winter fattening of lambs or wethers have been conducted this year. The spread between the price of feeders in the fall and the probable price of fat sheep in the spring was not sufficiently great to give inducement. Butchers will give almost as much for a lamb off pasture in the fall as they will for the same lamb the next spring. Under these conditions the raising of lambs is a much more attractive proposition than winter fattening.

BRANDON.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT, T. J. HARRISON, B.S.A.

SHEEP.

The flock of sheep on the Farm on March 31, 1914, was composed of the following: Shropshires, one ram, one ram lamb, seven ewes; Grades, eight ewes, four shearling ewes.

During the last year, six ram lambs and one aged ram were sold from the Farm for breeding purposes. In October there were purchased four Shropshire shearling ewes and one Shropshire shearling ram to strengthen the flock. These are all of a fine type of Shropshire and should aid materially in building up the flock on this Farm.

Supplementary to the handling of the flock of pure-bred sheep, which is established to procure data regarding the cost of rearing and maintaining sheep in the West, a sheep grading experiment is under way. The object of this test is to discover the possible improvement in regard to mutton and wool qualities by the continuous use of pure-bred rams of the same breed on the common ewes of mixed breeding and on their grade female progeny. The foundation flock in this work is the common range ewe, which can be procured quite reasonably in the western portion of this province.

FEEDING EXPERIMENTS.

One hundred range lambs were bought last November for the purpose of conducting a feeding experiment during the winter. These were divided into four groups of twenty-five each. The experiment was started on December 1, and completed at the end of sixteen weeks. From the outline below it will be noted that very satisfactory gains were made. However, a loss is reported as there was no margin between the buying and selling prices. The difficulty with feeding lambs during the winter is that it is necessary to buy them in the fall and pay a "lamb" price, and when they are sold in the spring we can only obtain a "sheep" price. In view of this fact it would appear that there is little money made in this line of work. Next season, however, shearlings will be purchased, which are cheaper than the lambs and will sell for the same price in the spring. Below is an outline of the rations fed to the different groups:—

Group 1.—Oat straw and grain.
Group 2.—Oat straw, mixed hay, and grain.
Group 3.—Oat straw, mixed hay, grain, and turnips.
Group 4.—Oat straw, alfalfa hay, grain, and turnips.

The grain in the above ration was composed of equal parts of oats and barley.

With the ration used in group 1 considerable trouble was experienced in keeping the lambs on their feed. This ration was very binding in its properties. In this group one lamb was lost, through indigestion, and it was found that the lambs required careful watching and needed a laxative from time to time. In group 2 a lamb was also lost, due to stone in the bladder. The lambs in groups 3 and 4 seemed to be quite contented and thrifty.

A week previous to the commencement of the experiment the lambs were arranged in their respective groups and fed their proper rations so as to get them accustomed to their feed before the experiment was set in running order. The prices charged for feed in computing the cost are as follows:—

Grain, $20 a ton.
Mixed hay, $10 a ton.
Alfalfa hay, $10 a ton (not well cured).
Turnips, $2 a ton.
Oat straw, $2 a ton.

Results of Lamb feeding Experiment, 1913-14.

	Group 1. Oat straw and grain (oats and barley in equal proportions.)	Group 2. Oat straw, mixed hay, and same grain.	Group 3. Oat straw, mixed hay, same grain, and turnips.	Group 4. Oat straw, alfalfa hay, same grain, and turnips.
Number of lambs in experiment	25	25	25	25
" days in "	112	112	112	112
Total weight at beginning of experiment ... lb.	1,590	1,770	1,902	1,970
" " end of experiment ... "	2,030	2,490	2,605	2,718
Gain during period (112 days) ... "	440	720	683	748
Gain per head ... "	17·6	28·8	27·3	29·9
Gain per day per head ... "	·19	·26	·25	·27
Amount of grain eaten by lot ... "	3,462·50	3,662·5	3,412 50	3,500·
" hay " " ... "	...	2,362.5	2,187·5	...
" alfalfa hay ... "	...	...	...	2,187·5
" oat straw ... "	1,980·	1,855	1,737·5	1,627·5
" turnips ... "	...	...	4,462·5	4,462·5
Total cost of feed ... $	3 58	50 20	51·18	51 96
Cost of feed per head ... $	1 46	2 00	2 04	2 07
" " " " per day ... cts.	$\cdot 013\frac{3}{10}$	$\cdot 01\frac{7}{10}$	$\cdot 01\frac{4}{5}$	$\cdot 01\frac{7}{15}$
" " " " pound gain ... cts.	$\cdot 08\frac{3}{10}$	$\cdot 06\frac{3}{4}$	$\cdot 07\frac{2}{5}$	$\cdot 06\frac{1}{15}$
Original cost of lambs ... $	95 40	106 20	115 32	119 20
" " " plus cost of feed ... $	131 98	156 40	166 50	171 16
Total receipts from sale ... $	121 80	149 40	156 30	163 08
Loss on lot ... $	10 18	7 00	10 20	8 08
" lamb ... cts.	.40	.28	.40	·32

From the foregoing it will be seen that, though the cost of feed per head in group 1 was the lowest, yet the cost of 1 pound gain was far in excess of any of the others and, as noted before, did not prove very satisfactory. This ration will be continued another season, but an endeavour will be made to have included some laxative food, such as flaxseed meal.

Strange to say, group 2 made better returns than group 3, even though the latter had the advantage of roots to keep their digestive organs in order. This can partly be accounted for by the fact that group 3 went off their feed during the first two weeks of the experiment, when it was attempted to make the roots and snow suffice without giving water also, since many people believe that sheep require no water. After this happened, all the groups received water and drank a little each day. Group 4, getting alfalfa and roots, gave the most satisfactory returns, and compared well in cost of feed per pound gain with group 2.

The conclusions that can be drawn are: (1) There is little profit in lamb feeding because of the difference in price of lamb and shearling; (2) the ration fed group 1, while the cheapest, was not satisfactory and was one of the most expensive when considering the cost per pound gain; (3) for the average farmer who has mixed hay, a ration fed as in group 2 would prove quite satisfactory; (4) where alfalfa is being grown, fattening sheep will respond to this feed most readily.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

SHEEP.

Twenty common range ewes were purchased in October, and were mated to a pure-bred Shropshire ram with the object of carrying on a grading up experiment with such sheep as are being generally brought into this country. Lambs from the first and each successive cross will be weighed at birth and periodically thereafter; samples of wool from the foundation flock and from each cross will be taken and data secured as to the effect of such grading on both mutton and wool production.

The cost of carrying these sheep through the winter was 1¾ cents per head per day. They consumed 2 pounds of hay at $10 per ton and three-quarters of a pound of oats at 1 cent per pound per head daily.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S

SHEEP FEEDING EXPERIMENT.

The work in lamb feeding was again carried out along similar lines as those followed during the past two winters with quite satisfactory results.

Two hundred and fifty range lambs and fifty yearling wethers were purchased from A. Green, of Taber, Alta., through Mr. Geo. Kerr. Delivery was taken on October 10. They were run on stubble fields till November 1, when the feeding experiment began.

GENERAL OUTLINE.

The primal object of the experiment was to obtain data regarding the possibility of marketing alfalfa hay profitably through the feeding of range sheep. They were divided into groups of fifty each. The yearlings were put in group I and were fed similarly to group II which was made up of lambs. In every case each group was fed what alfalfa they would clean up at all times. The different lots were fed as follows:—

Group I.—Alfalfa, meal and roots (yearlings).
Group II.—Alfalfa, meal and roots (lambs).
Group III.—Alfalfa and roots (lambs).
Group IV.—Alfalfa and meal (lambs).
Group V.—Alfalfa and screenings (lambs).
Group VI.—Alfalfa alone (lambs).

Groups I, II, IV, and V were sold March 15, but Groups III and VI, which were fed respectively alfalfa and roots and alfalfa alone, were carried for a longer period. From March 15 they were fed meal, and were sold May 9, being sheared just previous to this date. The yield of wool averaged 8 pounds per head and sold for 16½ cents per pound. The selling price of the four lots sold March 15 was $7 per cwt. with no shrink, and the price obtained for the two lots sheared was $6.60 per cwt., with no shrink. They were sold in each case to Delaney's Limited, of Lethbridge.

In calculating the cost of feeding, the following prices were charged:—

Alfalfa hay	$12 00 per ton.
Meal—equal parts of wheat, oats, and barley	20 00 "
Screenings	9 00 "
Roots (turnips)	3 00 "

The quality of the screenings fed this year was particularly good, as they contained in addition to weed seeds a good proportion of cracked wheat.

GENERAL STATEMENT.

		Group I Yearlings.	Group II Lambs.	Group III Lambs.	Group IV Lambs.	Group V Lambs.	Group VI Lambs.
Number of lambs or yearlings in lot at beginning of period		49	50	50	50	50	50
Number of lambs or yearlings in lot at end of period		49	49	47	50	48	46
Number of days in experiment		135	135	191	135	135	191
Total weight at beginning of experiment	Lb.	5,490	3,480	3,451	3,465	3,483	3,488
Average weight at beginning of experiment	"	112	69·6	69·2	69·3	69·7	69·8
Total weight at beginning of experiment after deducting weight of lambs	"	.....	3,410	3,243	.....	3,344	3,209
Total weight at end of experiment	"	6,900	5,908	4,735	4,943	4,919	4,610
Gain in pounds	"	1,410	1,598	1,492	1,487	1,665	1,401
Gain per head for period	"	28·8	32·6	31·7	29·7	32·4	33·5
Gain per head per day	"	·25	·24	·17	·22	·24	·16
Quantity of meal eaten by lot for period	"	5,870	5,648	1,692	5,578	275	1,692
Quantity of screenings eaten by lot for period	"	.....	.....	.....	.....	7,523	.....
Quantity of alfalfa hay eaten by lot for period	"	16,5[illegible]	10,505	14,[illegible]3	11,520	10,243	22,044
Quantity of roots eaten by lot for period	"	10,987	10,160	17,095	.....	.....	.....
Quantity of salt eaten by lot for period	"	103	103	138	104	101	103
Total cost of feed	$	173 96	135 78	154 54	125 94	99 07	159 21
Cost of feed eaten by the 49, 49, 47, 50, 48 and 46 respectively	"	173 96	134 60	153 22	125 94	98 94	145 46
Cost of feed per head for period	"	3 55	2 74	3 26	2 52	2 06	3 16
Cost of feed per head per day	cts.	2·63	2·03	1·70	1·86	1·52	1·65
Cost to produce 1 pound gain	"	12·33	8·20	10·27	8·47	6·16	10·38
Original cost of yearlings at $5, and lambs at $3.25 per head	$	245 00	159 25	152 75	162 50	156 00	149 50
Original cost plus cost of feed	"	418 96	293 85	305 97	288 44	254 94	294 96
Original cost plus cost of shearing at 9 cents per head, and cost of feed	"	.....	.....	310 20	.....	.....	299 10
Selling price at $7 per cwt., live weight	"	483 00	350 56	.....	346 01	346 43	.....
Selling price at $6.60 per cwt., live weight	"	.....	.....	312 51	.....	.....	304 26
Selling price at $6.60 per cwt., live weight, plus wool at 16½ cents per lb	"	.....	.....	374 55	.....	.....	364 98
Net gain in group	"	64 04	56 71	64 35	57 57	91 49	65 88
Net profit per head	"	1 31	1 16	1 37	1 15	1 90	1 42

AVERAGE, Three Years' Lamb feeding Experiments.

—		Lot I.	Lot II.	Lot III.	Lot IV.	Lot V.	Lot VI.
Number of lambs or yearlings in lot at beginning of period		*49·5	47	49·33	50	49·33	49·33
Number of lambs or yearlings in lot at end of period		49	46·33	48	49·67	48·67	47
Number of days in experiment		126	121	140	121	121	140
Total weight at beginning of experiment	Lb.	4,637	3,418	3,660	3,739	3,636	3,701
Average weight at beginning of experiment	"	93·7	72·7	74·2	74·8	74·7	75·0
Total weight at beginning of experiment after deducting weight of loss	"	4,599	3,368	3,564	3,713	3,640	3,531
Total weight at end of experiment	"	5,993	4,966	4,822	5,180	5,018	4,642
Gain for period	"	1,394	1,598	1,258	1,467	1,378	1,111
Gain per head for period	"	28·4	34·5	26·2	29·5	28·3	23·6
Gain per head per day	"	·23	·29	19	·24	·23	·17
Quantity of meal eaten by lot for period	"	5,544	5,400	1,476	5,747	92	3,070
Quantity of screenings eaten by lot for period	"	.....	.....	.....	.....	6,563	.....
Quantity of alfalfa hay eaten by lot for period	"	13,375	9,921	14,849	11,447	11,038	15,842
Quantity of roots eaten by lot for period	"	9,114	8,733	12,730	.....	.....	.....
Quantity of salt eaten by lot for period	"	52	34	46	35	34	34
Total cost of feed	$	149·87	122·27	118·17	122·51	84·18	111·52
Cost of feed eaten by the 49, 46·33, 48, 49·67, 48·67, and 47, respectively	$	149·23	121·11	117·53	122 04	84·14	108·91
Cost of feed per head for period	$	3·05	2·61	2·45	2·46	1·73	2·32
Cost of feed per head per day	Cts.	2·42	2·16	1·75	2·03	1·43	1·66
Cost to produce one pound gain	"	10·71	7·58	9·34	8·32	6 11	9·80
Original cost of sheep	$	214·38	151·74	159·68	165·94	161 69	156·58
Original cost plus cost of feed	$	363·61	272·85	277·21	287·98	245·83	265·49
Original cost plus cost of shearing and cost of feed	$	.....	.....	278·62	.....	.....	266·87
Selling price	$	406·80	320·55	325·73	334·64	324·88	314·01
Net profit on group	$	43·19	47·70	47·11	46·66	79·05	47·14
Net profit per head	$	·88	1·03	·98	·94	1·62	1 00

*This lot has only been fed two years.

SOME DEDUCTIONS.

As the prime object of the tests was to get some idea as to the price that could be obtained for alfalfa hay when fed to lambs, the figures given below will be of interest. The meal, roots, and screenings are charged at the prices mentioned, and all the profit is credited to alfalfa hay. The cost of labour is omitted, for the amount involved in experimental feeding when such small lots are fed in each case is so much greater than would be the case when a farmer would be feeding on a more extensive scale, that it is hardly comparable. However, it might be safe to assume that it would not be much greater than the cost of baling and delivering to cars in case a farmer was selling his hay outright.

Price obtained for alfalfa hay when all the profit is credited to it:—

Group.	Alfalfa hay per ton.
I	$19 85
II	22 80
III	18 90
IV	21 99
V	29 86
VI	18 25
	$131 65
Average price	$21 95

The average price obtained for alfalfa hay when computed in the same manner for the past three years for all lots fed is $19.49 per ton.

VALUE OF ROOTS.

The relatively small increase in gains of the lots fed roots would indicate that under our conditions it is not particularly profitable to raise them for this purpose.

LETHBRIDGE

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

SHEEP.

This year there were kept through the season eighteen ewes eligible to raise lambs. Two ewes would not breed and two died of pneumonia. The old ram was sold at the close of the breeding season.

The results this year from the flock are not as good as the previous year, although from a money-making point of view, the flock may have been more profitable than before. The whole flock ran to pasture the entire year and ate pasture that would otherwise have gone to waste. They were fed hay for eight days in February, and some at lambing time. The entire flock consumed 840 pounds, making a total cost of 50 cents per sheep for hay. Even with feeding such as this, the sheep became very fat, and trouble at lambing time resulted. Two ewes would not breed, two died of pneumonia early in the season; one was a sheep that had an attack last year, and the other was a fresh case. Both cases came on in good weather and the cause could not be ascertained.

At lambing time, some of the lambs were born deformed, some had not strength to get up, and others were blind. From all these causes, the mortality in the lambs was high. The lambing results of the season are as follows:—

Total number of ewes	14
Total number of lambs dropped	26
Total number of lambs dropped per ewe	1·84
Total number of lambs raised	16
Average number of lambs raised per ewe	1·14
Per cent of lambs raised	61·5%

One of the ewes raised a pair of lambs in the autumn of 1913, but they are not counted in the above. She also had a strong lamb in March, 1914. Two other ewes had lambs in the autumn but did not raise them.

The wool from the flock was of good quality and quantity. The heaviest fleece was 11·1 pounds, from a yearling, and the lightest was 4·5 pounds, from the ewe which raised the two sets of lambs. The average for the flock was 7·28 pounds per ewe.

No experimental work was done on account of not having sufficient housing accommodation.

SWINE.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN,

E. S. ARCHIBALD, B.A., B.S.A.

There are 217 head of swine of all breeds and ages now on the Central Experimental Farm. These are used for experimental breeding, feeding, and housing, as well as for sales of high-class breeders at a reasonable figure. The breeds kept are Berkshire, Tamworth, and Yorkshire.

The Berkshires are 37 in number, including 18 breeding sows, 17 young pigs and 2 boars.

The Tamworths are 31 in number, including 10 breeding sows, 19 young pigs and 2 boars.

The Yorkshires are 149 in number, including 34 breeding sows, 110 young pigs and 5 boars.

The main piggery, erected in 1910, continues to give excellent satisfaction in all respects, both for experimental feeding work and also in its uses for farrowing season, feed rooms, and the like. The housing of brood sows, during both winter and summer, in the single-board cabins has also continued to give good results.

The increasing sales and demand from individual farmers and agricultural societies for young breeding pigs may again be reported, and is a healthy indication of the added interest of the farmers, both in the Experimental Farms and in the swine industry.

The experimental feeding work, together with general supervision of the breeding operations, was conducted by Mr. D. D. Gray, to whom special credit is due for the returns, which are quite satisfactory considering the crowded condition of the buildings.

PIG FEEDING EXPERIMENT.

In October, 1913, a pig feeding experiment was started to determine the value of various grains fed in different ways, with and without supplements; this being, in part, a continuation of the work carried on in the fiscal year ending March 31, 1913. The object of this experiment was: (1) to determine the value of the hog motor grinder; (2) the value of dry feeding versus slop feeding; (3) the value of home-grown grains alone versus supplements; (4) the value of milk as a supplement to grain; and (5) the value of roots as a supplement to grain. The home-grown grains chosen were barley, oats, and wheat, mixed in varying proportions. Six lots of pigs were started on this experiment. However, owing to the fact that the pigs on the hog motor grinder did not seem to have as fair a chance as the others, and owing to the fire which destroyed the cattle barns, this experiment was discontinued, but will be taken up again on a more complete scale during the coming fiscal year.

SOW FEEDING EXPERIMENT.

Although the main piggery was, during the winter, utilized for calf feeding, yet experimental work with the brood sows housed in single board cabins was quite possible.

A great deal of work, with more or less indefinite results, along the lines of feeding of tankage to pigs, has been carried on by individual farmers and experiment stations throughout America. A series of experiments has been outlined on the Central Experimental Farm and branch Farms and Stations toward the determination of the value of tankage fed to both sows and litters, and both as an addition to the regular feed and as a supplement to some of the foodstuffs which in many cases are not available to the average farmer. A start was made in this work in the fall of 1913, and although only a small proportion of this first experiment has, as yet, reached completion, yet a brief summary of results will show the line of work started and results to date. However, it must be held in mind that this is only a part of one year's experiment, which, even though complete for one period, will be altogether too incomplete for definite conclusions.

Objects of Experiment.

The objects of this first experiment with tankage were to determine the value of tankage fed to in-pig sows as an influence on the condition of the sow during pregnancy, the condition of the litters at birth, and the influence on the milking qualities of the sow during the first eight weeks after parturition.

Plan of Experiment.

Two pens of eight brood sows each were set aside for this work. These sows were of uniform nature, both as to age, weight, general type, and breeding qualities.

Pen I. was to be fed the regular winter meal mixture, namely, a combination of wheat bran and shorts, varying with the advancing season.

Pen II. was to be fed the regular meal mixture, as pen I., with the exception that one-third (33 per cent in weight) of this mixture was replaced by tankage.

In both pens meal was fed in the same way, and each pen was to receive approximately the same amount of water, roots, clover hay, and skim-milk when available.

The regular winter meal for brood sows consisted of a mixture of bran, two parts, and shorts, one part, from December 1 until February 1, and a mixture of bran, two parts, and shorts, two parts, for the second period, namely, from February 1 until farrowing.

Although it is the practice on the Central Experimental Farm to add other ingredients after farrowing in order to make a somewhat more concentrated ration for nursing sows, yet the above mixtures were continued until eight weeks after farrowing, in order to give comparative results as to the tankage. Samples of meals were taken for chemical analyses, which will be reported on when this line of experimental work has reached greater dimensions.

Valuation of Foodstuffs.

The following valuations were placed on the meals and forages consumed:—

Bran	$20 00 per ton.
[illegible]	25 00 "
Tankage (protein, 60 per cent; fat, 8 per cent; fibre, 6 per [illegible]	50 00 "
Roots	2 00 "

PEN I.—BROOD SOW EXPERIMENT, 1913-14,—MEAL.

Breed.	Farrow.	Date of service.	Date of farrowing.	Weight December 10.	Weight before farrowing.	Weight of sows 4 weeks after farrowing.	Weight of sows 8 weeks after farrowing.	Number in litter.	Weight of litters.	Number in litter 4 weeks after farrowing.	Weight of litter 4 weeks after farrowing.	Number in litter 8 weeks after farrowing.	Weight of litter 8 weeks after farrowing.	Amount of meal consumed up to farrowing time.	Amount of roots consumed up to farrowing time.	Meal consumed 8 weeks after farrowing.	Total cost of ration.	Days on experiment.	Ration.
				Lb.	Lb.	Lb.	Lb.		Lb.		Lb.		Lb.	Lb.	Lb.	Lb.	$ cts.		Meal mixture.
Yorkshire	272	Dec. 11 '13	Apr. 5 '14	385	430	363	351	10—1 good, 6 dead.	24½	3	41½	3	68	557	456	392	....	172	Bran and shorts.
Yorkshire	236A	Dec. 27 '13	Apr. 19 '14	345	375	275	273	14—12 good, 2 small	27½	10	79½	6	113	655	456	392	....	186	Period I { Bran 2, shorts 1.
Yorkshire	257	Dec. 26 '13	Apr. 18 '14	380	435	323	300	11—all good.	28	7	83	5	54	648	456	392	..	185	Fed up to Feb. 1, 1914
Berkshire	262	Dec. 9 '13	Apr. 3 '14	490	560	477	443	10—all good.	29	4	48	4	87	543	456	392	....	170	Period II { Bran 2, shorts 2.
Yorkshire	221A	Dec. 8 '13	Apr. 2 '14	390	550	440	365	9—all good	23	9	124½	9	209½	536	456	392	.....	169	From F. b. 1 to end of experiment.
Total	..	..	..	1990	2350	1888	1732	....	132	33	376 5	27	531.5	2940	2280	1960	54.48	....	
Average 5 head	..	..	..	398	470	377.6	346.4	10.8	26.4	6 6	75 3	5.4	106.3	588	456	392	10·89	176	

PEN II—MEAL AND TANKAGE.

				Lb.	Lb.	Lb.	Lb.		Lb.		Lb.		Lb.	Lb.	Lb.	Lb.	$ cts.		Meal Mixture.
Yorkshire	219	Nov. 29 '13	Mar. 25 '14	455	490	413	349	9—8 good, 1 small	24	8	102	7	175.5	480	456	392	....	161	Bran and shorts with one third tankage in each case. Period I same as Pen with tankage. Period II same as Pen I with tankage.
Yorkshire	212A	Dec. 2 '13	Mar. 26 '14	435	505	434	414	7—6 good, 1 small	20	4	55	4	116 5	487	456	392	....	162	
Yorkshire	277	Nov. 29 '13	Mar. 23 '14	405	465	321	288	12—11 good, 1 small	28 5	9	131	8	191.5	466	456	392	.....	159	
Yorkshire	240A	Dec. 5 '13	Mar. 31 '14	395	435	379	344	8—7 good, 1 small	19 5	7	113	7	209.5	522	456	392	...	167	
Yorkshire	217A	Dec. 4 '13	Mar. 28 '14	360	455	382	326	12—all good.	26.5	9	98.5	8	175 5	501	456	392	....	164	
Total	..	..	..	2050	2350	1929	1721	49	118.5	37	499.5	34	859.5	2455	2280	1960	70.33	....	
Average 5 head	..	..	..	410	470	385.8	344.2	9.8	23.7	7.4	99.9	6.8	171 9	491	456	392	14.07	163	

OTTAWA

DEDUCTIONS FROM EXPERIMENT.

No definite deductions could be drawn from a one-year experiment, and especially where so few individuals were included. However, many interesting facts may be noted in the above tables, which might be summarized as follows:—

1. The tankage-fed sows (pen II) did not consume as much meal as pen I, where no tankage was fed. By comparing the weights of the two pens of sows throughout the experiment it will be noticed that all sows were practically of the same weight at each stage of the experiment, and that the proportionate loss of weight per sow in the advanced stage of lactation was practically uniform in each case.

2. The natural deduction from such comparative figures would be that any variation in the increasing weight of the litters would be due to the milk-producing properties of the meals consumed by the sows during nursing period.

3. Undoubtedly the mortality in all litters was much higher than should be. This, however, was due, in all cases except sow No. 1 of pen No. 1, to the carelessness on the part of the sow several days after the pigs were farrowed. Undoubtedly the average pig from the tankage-fed sows was more rugged than the average pig from the sows which received no tankage. By a comparison of the weights of litters at farrowing, at four weeks of age, and at eight weeks of age it will be noticed that the average pig in pen I weighed 2·44 pounds at birth, 11·4 pounds at four weeks of age, and 19·7 pounds at eight weeks of age, while the average pig in pen II weighed 2·42 pounds at birth, 13·5 pounds four weeks after farrowing, and 25·3 pounds eight weeks after farrowing.

4. From the above figures it will be noted that there was practically no difference in the average pigs at birth, which is somewhat contrary to the results of experiments reported from various experiment stations throughout America. However, the more rapid increase in weight of the small pigs during the nursing period would warrant a continuation of this experiment, and a more complete study from this and other viewpoints.

5. It will be noticed that the cost of feeding pen I amounted to $10.89 per sow for the 176 days on experiment, while the cost of feeding pen II amounted to $14.07 per sow for the 163 days on experiment. Although the tankage is, when fed in these proportions, expensive for the feeding of brood sows, yet in the above instance the difference in cost was more than counterbalanced by the greater ruggedness of litters, lower percentage of mortality, and the increased weight of litters at eight weeks of age. This, however, is but the result of one experiment.

A repetition of this experiment, together with the several lines of experimental work in the use of tankage and other meals in the feeding of young pigs, is already under way and more complete data along the lines of this foodstuff will be available for publication in the near future.

Readers are particularly referred to the report of the Dominion Chemist, Mr. F. T. Shutt, in which may be found the chemical analyses of the foodstuffs under experiment.

OTTAWA.

EXPERIMENTAL FARM, NAPPAN, N. S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

BREEDING SWINE.

In the spring of 1912-13 there were only five breeding swine at this Station, hence it was decided to increase them to ten, adding two Berkshire and three Yorkshire sows, so at present there are: Three Berkshire sows, one Berkshire boar, five Yorkshire sows, one Yorkshire boar.

The Berkshires are all in good shape and are excellent pigs.

Two of the Yorkshire sows are getting somewhat aged, and will be disposed of. The other three are young, in fact, just a year old, and are developing into three very fine sows.

During the season of 1913 only fair success was met with in the litters. The Berkshire sow only gave a litter of six, and lost one. One of the Yorkshires gave a nice litter of eleven, but was a very clumsy mother, and tramped and laid on five. The other Yorkshire sow gave only five and killed two of those, so that there were but few to dispose of.

As the present piggery is not at all suitable for pigs, it was decided to build four colony houses for housing boars and sows. The accompanying plate will show the structure of these cabins.

During last winter all sows and boars were wintered in these houses except for just a short period. While there was a little more feed and labour connected with it, we found that the sows wintered in excellent shape and were in good condition at farrowing time. They were moved into warmer quarters a week or more before farrowing date. This allowed them to get accustomed to the quarters and feed inside.

For the greater part of the time, they received shorts and bran, with cracked corn when it could be had, in the following amounts: shorts 2½; bran 1; cracked corn 1½; by weight, or, when shorts and bran only were used, it was shorts 3 and bran 1.

The following is a financial statement of the piggery:—

FINANCIAL STATEMENT of Piggery for 1913-14.

Sales during the year	$172 18
Value of manure	6 00
Value of pigs on hand April 1, 1914	300 00
	$478 18
Cost of feed and bedding	$198 94
Cost of labour	164 25
Cost of new stock	55 00
Value of stock on hand April 1, 1913	125 00
	$543 19
Net balance against pigs	$65 01

NOTE.—The reasons for there being a balance against the pigs are: First, the number was too small to warrant full time for one man, yet the time spent on these is sufficient to attend to twice or even three times as many more; Second, the bad luck with the litters last season; Third, the addition of new stock.

FEEDING SWINE.

Not having any facilities for carrying on any experiments in feeding, no work was done along this line. Four of the small pigs which were not sold were fed on a mixture of shorts and cracked corn for the respective periods, as per table of food consumed. Below is a statement of returns and profits:—

Number of Pigs.	Time Fed.	Meal.	Cost of feed.
2	July 27, 1913, to March 2, 1914, 218 days	1,424	$21.79
2	May 21, 1913, to December 19, 1913, 212 days	1,364	20.87
		2,788	$42.66

EXPENDITURE.

First pair, cost of feed consumed	$21 79
Second pair, cost of feed consumed	20 87
Labour	30 00
Cost of four pigs at $3	12 00
	$84 66

RETURNS.

First pair, 390 pounds pork at 12 cents per pound	$46 80
Second pair, 388 pounds pork at 13½ cents per pound	52 38
	$99 18
Net balance	$14 52

Central Experimental Farm, Ottawa. Sows on Pasture. The shelters are the same in which brood sows are wintered.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. A. LANCELIER.

SWINE.

There are only three sows on the Farm, pure-bred Yorkshires. The piggery is to be transformed into a sheep barn and, pending the construction of a new building, it will be impossible to keep many hogs. A boar from this Station made the highest price, in October, 1913, of any hog at the sale of the Provincial Department of Agriculture at Quebec. As soon as proper accommodation is available, a larger herd of Yorkshires will be established and feeding tests will be started.

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIERE, QUE.

REPORT OF THE SUPERINTENDENT, JOS. BEGIN.

SWINE.

During the past fiscal year, a small start was made in swine operations in the transfer of an excellent Yorkshire boar and two first-class yearling Yorkshire sows from the Experimental Station, Cap Rouge, Que., to this Station. During the past winter, accommodations for these individuals were most inconvenient; nevertheless the spring litters from these sows were fairly good.

A modern, inexpensive, but complete piggery is anticipated during the coming year, in which feeding experimental work with swine will be conducted. At such time as more ample accommodations are available, the swine breeding work will also be considerably enlarged, as this department of the live stock industry, for this district of Quebec, deserves immediate attention.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

SWINE.

There are 37 swine on this Farm on March 31, 1914. They are divided as follows: Yorkshire, 1 boar, 5 brood sows and 4 young pigs; Berkshire, 1 boar, 2 brood sows and 3 young pigs; experimental feeders, 21.

Four Yorkshire boars and four Yorkshire sows have been sold to farmers for breeding purposes. As no stock boar of the Berkshire breed was on hand until late in the season, the Berkshire sows were bred to the Yorkshire boar and the crossbred offspring used for pork production. The surplus Yorkshire young pigs were used in the same way.

SWINE FEEDING EXPERIMENT.

BARLEY *vs.* OATS *vs.* SHORTS.

A feeding test was conducted in which oats, barley, and shorts were compared as winter feeds for the production of pork. The pigs used averaged between 65 and 70 pounds at the start of the test.

Lot 1 received ground oats as the main portion of their feed; lot 2 received ground barley; and lot 3 received shorts. All three lots received one part of feed flour to three parts of the principal meal fed. All received a small ration of mangels—from 2 to 3 pounds per pig per day. These feeds were charged against them at the following rates: Oats, 30 cents per bushel; barley, 40 cents per bushel; feed flour, $28 per ton; mangels, $3 per ton.

The lot that were fed shorts became crippled and went very badly off feed early in the test, consequently that part of the experiment had to be dropped. Some of the pigs in the other lots showed a tendency in the same direction, but the majority did well and even the poorer ones did not get seriously wrong.

The individual and average gains per month and for the whole period are as follows:—

Lot 1.—Fed Ground Oats (with Feed Flour and Mangels).

Pig.	Weight Nov. 27.	Weight Dec. 27.	Weight Jan. 27.	Weight Feb. 27.	Weight March 27.	Gain in 4 months.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
No. 942	65	62	75	89	143	68
No. 943	63	86	102	113	128	62
No. 944	67	96	117	129	143	76
No. 945	64	91	105	124	149	85
No. 946	75	101	115	122	148	70
No. 940	70	98	116	129	133	63
No. 941	72	103	118	134	154	82
Total	457	637	748	881	963	506
Average per pig	65⅓	91	106⅞	118⅞	137⅛	72⅜

Lot 2.—Fed Ground Barley (with Feed Flour and Mangels).

Pig.	Weight Nov. 27.	Weight Dec. 27.	Weight Jan. 27.	Weight Feb. 27.	Weight March 27.	Gain in 4 months.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
No. 947	73	107	125	128	150	77
No. 948	79	116	132	143	146	67
No. 949	80	95	111	145	158	78
No. 950	59	76	86	103	131	81
No. 951	62	94	114	139	174	112
No. 952	68	97	111	124	139	71
No. 953	45	65	81	100	122	77
Total	457	644	760	882	1,020	563
Average per pig	65⅓	92	108⅝	126	145⅞	80⅜

Lot 3.—Fed Shorts (with Feed Flour and Mangels).

Pig.	Weight Nov. 27.	Weight Dec. 27.	Weight Jan. 27.	Weight Feb. 27.	Weight Mar. 27.
	Lb.	Lb.	Lb.	Lb.	Lb.
No. 954	88	112	115		
No. 954	68	96	115		
No. 955	65	97	105		
No. 956	61	87	97		
No. 957	65	91	90		
No. 958	70	97	112		
No. 959	69	95	102		
Total	486	675	736		
Average per pig	69⅜	96⅜	105		

Pigs became crippled and went off their feed during January; the method of feeding was changed on January 31 in order to try to restore their health.

BRANDON

Summary of Results.

		Lot 1.	Lot. 2.
No. of pigs in lot		7	7
Weight at start of test November 27, 1913	Lb.	457	457
Weight at end of test March 27, 1914	"	963	1,020
Gain in four months		506	563
Gain per pig per day		·6	·67
Total amount of oats fed	"	1,638	
Total amount of barley fed	"		1,638
Total amount of feed flour fed		548	548
Total amount of mangels fed	"	1,016	1,016
Total cost of feed	$	23 61	22 84
Cost of feed per 100 pounds gain in weight	$	4 66	4 03

This experiment would indicate that, whatever may be the value of the shorts for milking sows and freshly weaned pigs, it is not a satisfactory winter feed for half-grown pigs unless it is fed in combination with some coarse lighter feed, such as ground barley or oats. When fed alone or with feed flour it induced digestive troubles and crippling. Last year's results were corroborative of this conclusion.

In comparing oats and barley, results are not very conclusive, but in as far as they give any evidence are in favour of barley, for the production of larger and cheaper gains.

FEEDING TWICE A DAY *vs.* THREE TIMES.

A feeding test was conducted in which feeding pigs three times a day was compared with feeding twice a day. The pigs were Yorkshires and grade Yorkshires. The test was started on November 27 and was completed on February 27, when the pigs were ready for market. Lot 4 weighed 117¾ pounds average per pig at the start, and lot 5 weighed 120½ pounds average. Both lots received 3 pounds of barley chop and 1 pound of feed flour per pig per day part of the period, and 4½ pounds of barley chop and 1½ pounds of feed per pig per day the rest of the time. Both lots received about 2 to 3 pounds of mangels per pig per day. These feeds were charged at the following rates: Barley, 40 cents per bushel; feed flour, $28 per ton; mangels, $3 per ton. The following are the gains made per month and for the whole period:—

Lot 4.—Fed Twice a Day.

Pig.	Weight Nov. 27,	Weight Dec. 27.	Weight Jan. 27.	Weight Feb. 27.	Gains in 3 month.
	Lb.	Lb.	Lb.	Lb.	Lb.
No. 891	139	188	205	241	102
No. 892	113	175	185	228	115
No. 894	132	195	213	260	128
No. 895	87	119	131	160	73
Total	471	677	734	889	418
Average per pig	117¾	169¼	183½	222½	104½

Lot 5.—Fed Three Times a Day.

Pig.	Weight Nov. 27.	Weight Dec. 27.	Weight Jan. 27.	Weight Feb. 27.	Gain in 3 months.
	Lb.	Lb.	Lb.	Lb.	Lb.
No. [illegible]	118	165	202	217	99
No. [illegible]	13	177	210	231	100
No. [illegible]	135	175	205	240	105
No. [illegible]	98	146	180	197	99
Total	482	663	797	885	403
Average per pig	120½	165¾	199¼	221¼	100¾

Summary of Results.

	Lot 4.	Lot 5.
Number of pigs in lot	4	4
Weight at start of test November 27, 1913 Lb.	471	482
Weight at end of test February 27, 1914 "	889	885
Gain in three months "	418	403
Gain per pig per day "	1·13	1·1
Total amount of barley fed "	1,155	1,155
Total amount of feed flour fed "	385	385
Total amount of mangels fed "	578	578
Total cost of feed $	14·01	14·01
Cost of feed per 100 pounds gain in weight $	3·35	3·45

The results would indicate that there is no advantage in feeding pigs of this size more frequently than twice a day. A single experiment is never conclusive, but similar experiments elsewhere tend, on the whole, to corroborate this conclusion.

The ration used, viz., 3 parts of ground barley to 1 part of feed flour to 2 parts of mangels, is one that gives rapid and cheaply produced gains with pigs of the size used in this experiment.

PIGGERY.

The accompanying plans of piggery erected at the Experimental Farm, Brandon, Man., during the summer of 1913, are for the most part self-explanatory. However, a few added notes regarding the same may make these more comprehensive.

This piggery is 82 feet long, 32 feet wide and with a 13-foot post above foundation wall. A wing 15 feet wide and 32 feet long gives ample accommodation for feed room, stairways, meal room, etc., with a root cellar below. The dimensions inside the piggery are as follows: passage, 6 feet wide; pens, 10 by 12 feet; feed room, 20 by 22 feet; and ceiling, 9 feet clear. In each of the pens is a small sleeping pen of the dimension 6 by 7 feet. In each of the farrowing pens is a guardrail composed of 2-inch iron pipe set 12 inches above the cement floor and 10 inches out from the wall. The troughs are of concrete and are 6 inches deep and 10 inches wide, inside measurements. The pen fronts are 8 inches high next the main passage and 10 inches high in pens, and are on the same level as the top of foundation wall.

FOUNDATION.

The foundation wall about the piggery is of concrete, same being 12 inches thick. Cement bolts were inserted in the cement wall with which to bolt down the sill. This cement foundation wall extends above the floor of pens to a height of 10 inches, and extends 2 feet below the grade line outside of building. This wall stands on a 12- by 15-inch concrete footing. Within the piggery a 4-inch cement wall supports the division, with somewhat heavier buttresses at corners of pens carrying the posts.

FLOORS.

The floors throughout this building are of concrete, excepting the floor of feed room over root cellar. All floors have ample drainage. Underneath floor of main passage is an 8-inch drain running lengthwise of the building, into which a 4-inch drain empties from each pair of pens. The floors of pens were given a rough finish, and the floor of main passage crowned 1 inch and rolled to give a rough finish.

LEVELS AND GRADES.

The floors of pens are 2 inches lower at the front than the level of main passage. The fronts of pens are 8 inches above the passage level next pens. The passage has a crown of 1 inch to centre. On the edge of passage, directly against the concrete pen fronts, is a gutter 2 inches wide, this grading alternately for each pair of pens, passing through the pen fronts and emptying into the 4-inch drain of each pair of pens. The floor of pens falls towards centres 2 inches in 3 feet from passage, from which there is a rise of 1 inch in 2 feet and 2 inches to the rear of pen. Each pair of pens drains to the 4-inch drain placed in the division between the two pens.

SUPERSTRUCTURE.

The superstructure is made of 2- by 6-inch planking throughout, excepting the joists and girths which are made of 2- by 10-inch planking. The walls are most economically constructed, as follows: On the outside of posts and studs is one ply of building paper, covered by vertical planed boards with battens over cracks. On the inside of posts and studs is a layer of specially prepared building paper called "Linofelt," covered by ⅞-inch sheathing in the piggery below but not in the loft. All divisions between pens are of 1¼-inch matched sheathing topped with grooved and bevelled header. A sliding door crossing the main passage at the south side of feed room completely shuts off one-half of the piggery, thus allowing the maintenance of higher temperature in the portion set aside for farrowing sows.

LIGHT.

As per illustration, all the light possible is installed in this piggery, in order to get it perfectly sanitary and cheerful. Although this necessitates storm windows for winter, yet a much more sanitary piggery for breeding purposes is the result.

VENTILATION.

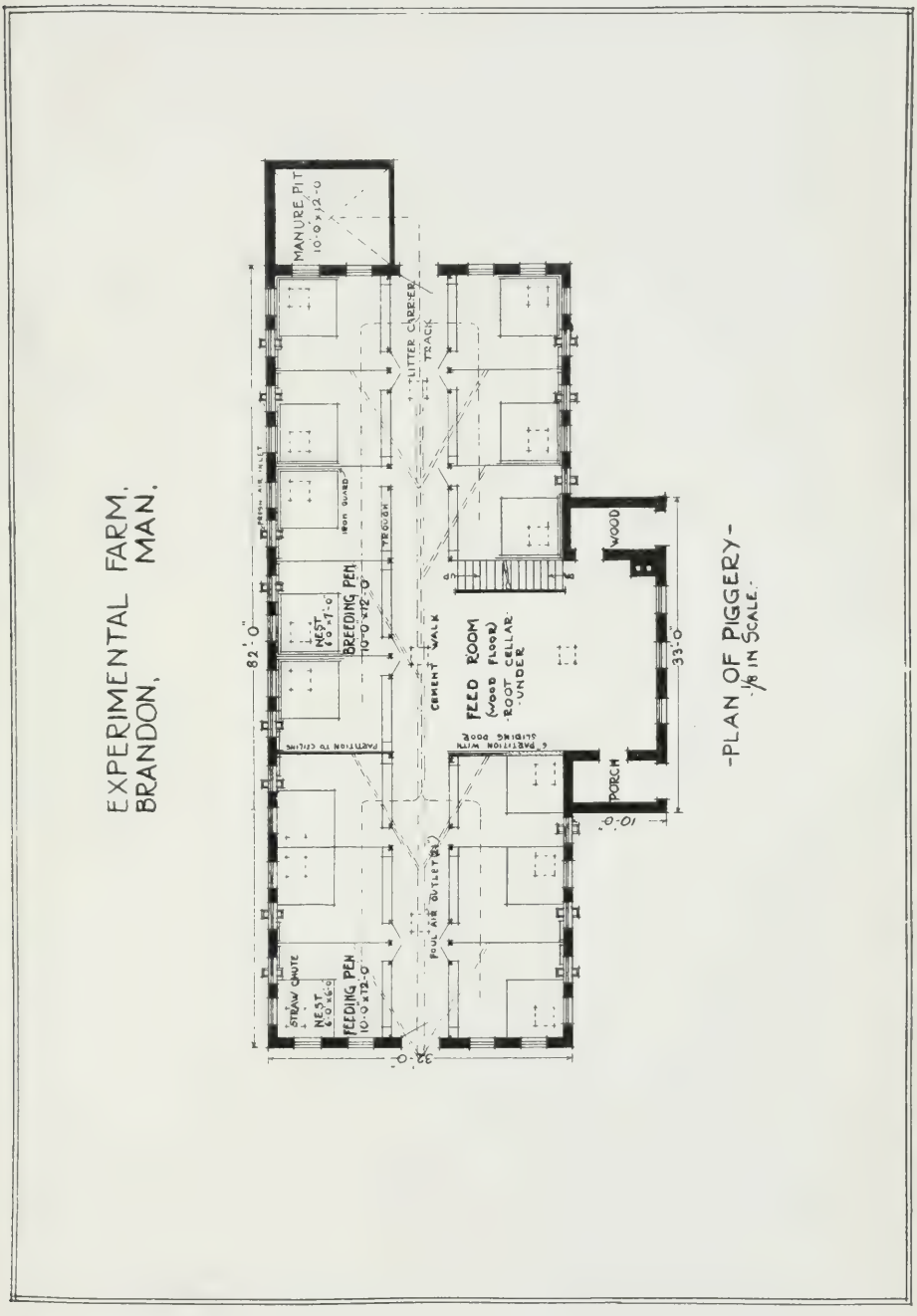
The ventilation is of the Rutherford system. Each pair of pens has a fresh-air intake which brings the fresh air in 3 feet above floor. The foul-air outlets run from the ceiling of feed passage through the loft to the cupolas on roof. These outlets are made of two ply ⅞-inch matched sheathing with dead air space between in order to prevent condensation. Both incoming and outgoing air are controlled by dampers in ventilators.

CONCLUDED.

Underneath the feed room is a root cellar with a capacity of approximately 2,000 bushels, with adequate ventilation for the same. The piggery is fitted with a litter carrier in order to facilitate the cleaning out of pens. Meal bins, with hopper-shaped bottoms, are installed over feed room, from which chutes convey the meal to the feed room below. A feed cooker is installed in the feed room, the same fitted with the necessary hoods, counter-weights, steam outlets, etc., in order to keep the piggery as free from steam and as dry and wholesome as possible.

A sink is also installed in the feed room for the washing of pails, etc.

A manure pit, 10 by 12 feet, 2 feet in depth, will eventually be placed at the end of piggery, but only in order to keep clean the location of the manure cart.


EXPERIMENTAL FARM,
BRANDON, MAN.
MANURE PIT
10'0"x12'0"
LITTER CARRIER TRACK
82'0"
BREEDING PEN
10'0"x12'0"
FEED ROOM
(WOOD FLOOR)
ROOT CELLAR
UNDER
CEMENT WALK
WOOD
PORCH
33'0"
10'0"
FEEDING PEN
10'0"x12'0"
-PLAN OF PIGGERY-
1/8 IN SCALE.

Exterior View of Piggery, Brandon, Man.

Brandon Experimental Farm. View of Interior of Piggery.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT, T. J. HARRISON, B.S.A.

SWINE.

At this date the herd of swine on the Indian Head Experimental Farm consists of one Yorkshire boar, four Yorkshire sows and one Berkshire sow. The Berkshire boar was sold to the butcher some weeks ago for the reason that his usefulness was past.

During the year a number of young pigs were sold to farmers for breeding purposes. The following is a list of the animals sold: four Yorkshire boars and three Yorkshire sows. In this connection it may be well to note that the demand greatly exceeded the supply.

A very fair type prevails in the herd of bacon hogs, the Yorkshires being headed by a boar of splendid quality and conformation, and it is hoped that in the near future a Berkshire of equal standing may be procured. With the present equipment any extensive feeding experiments are impossible. The only work done in this connection was a test in regard to feeding sows in the piggery and outside in cabins. Two sows were kept in a single-board 6- by 8-foot cabin all winter, and thrived exceedingly well, one of them having already given birth to a healthy but small litter. Those kept inside were not under good conditions as the old piggery is dark and poorly ventilated. From the results so far it would seem to indicate that brood sows can be housed outside during the winter quite satisfactorily. With a more up-to-date piggery and a larger number of sows something more definite along this line may, during another season, be undertaken.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

SWINE.

Two pure breeds of hogs are kept, viz., Yorkshire and Berkshire. Six sows are being kept over and were wintered at a cost of 1.86 cents per head daily. These sows, however, run in the corrals and no doubt secured a part of their ration there. What they got in this way would not be very great, as the stock in the corrals were fed [illegible] ground grain. It is hoped that we will be in a position next year to increase the number of sows kept.

The Yorkshire boar "Summerhill Gentleman 5th—39206", farrowed November 2, 1912, now weighs, in moderate condition, 665 pounds.

The following table shows the cost of a litter of pigs farrowed November 9, 1912, and marketed at $8.65 per hundred on May 1, 1913. Though these pigs were produced on the Farm they were charged up at $3.50 each at weaning:—

[illegible] weaning at $3.50 each		$21 00
2,095 pounds chop at 1 cent per pound		20 95
[illegible] pasture [illegible] at $1.25 per cwt.		2 70
5,000 pounds skim-milk at 20 cents per cwt.		10 00
Total cost		$54 65
1,085 pounds pork at $8.65 per cwt.	$93.85	
[illegible]		39 20
	[illegible]	$93 85

[illegible] per litter [illegible]

A number of pigs were sold for breeding purposes during the year.

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

BREEDING WORK.

During this year the breeding stock of Yorkshire hogs has been greatly increased. There are at present twenty-seven head of breeders (one aged boar and two young ones, eight sows over 1 year, and sixteen sows 1 year or under). There will also be a number raised from the summer litters to still increase the herd and to replace some of the old sows that are becoming worn out.

All the young stock shows an improvement in both size and type on the older material. The breeding stock has all been kept in the "A"-shaped colony houses during the year, with the exception of two weeks at farrowing time. This method has proved most satisfactory, particularly for young, growing sows. These cots were tried, in a few cases, for farrowing sows, but they did not prove satisfactory for winter conditions. The greatest loss was with heavy, old sows, and, on the average, 40 per cent of the pigs farrowed were killed. No losses were experienced when the pigs have been farrowed in the piggery and put into the cots at two weeks of age; the young pigs grow stronger and the sows keep in better health than when they are kept in the piggery a longer period. The sows are all given pasture or mangels, according to the season, and they get a meal mixture of barley, peas, oats, and shorts. At times they get a little skim-milk, which, even in small quantities, is most beneficial.

The young pigs are weaned at 8 or 10 weeks, but are taught to feed on skim-milk and shorts when 3 weeks old, and, by the time they are taken from the sows, they seldom or never stop gaining.

The demand for breeding stock has been strong this year, so strong that the proportion of orders filled is not known. All surplus stock that was of the best quality were sold, and any inferior pigs were put into feeding pens.

Three grade Yorkshire sows were kept to breed pigs for the experimental work. They were good, young sows, and produced well, but pure-breds of the same age were more profitable. They were sold at the close of the year. There has not been any disease or loss from disease in the breeding stock this year.

The following short table will give in condensed form the work of the sows over 1 year old. Slightly better results were obtained in winter than in summer. The second table gives the food cost per pig weaned at 60 days and raised in winter. The figures were taken from the performance of two sows 2 years old. They were started, after weaning a litter, very thin in flesh, and at farrowing time they were in excellent condition. They were kept in a paddock and housed in a cot. The winter was mild and some food was obtained from the paddock, which is not accounted for in the table. Further work of a similar nature is being done to get the average of a greater number of sows and litters.

TABLE IV.

Year.	Number of sows.	Number of litters.	Number of pigs farrowed.	Average number farrowed per sow.	Number of pigs raised.	Average number raised per sow.	Per cent raised.
							%
1913-14.	8	14	151	10·78	115	8·2	76·1
Summer litters.	6	7	71	10·14	54	7·7	76·05
Winter litters...	7	7	80	11·4	61	8·7	76·25

TABLE IB.

Sow number.	Age.	Summer litters.		Winter litters.	
		Number farrowed.	Number raised.	Number farrowed.	Number raised.
	Years.				
2	6	18	9	10	8
3	4	11	8	11	5
10	2	12	10	12	11
11	2	9	6	10	9
12	1 5	7	7	13	10
13	1 5	.....	.....	14	8
17	1 2	14	14	.....	.....
18	1 2	.....	.....	10	10
		71	54	80	61

TABLE No 2.

Food cost to keep a sow and raise young pigs in winter. Average of two sows, each 2 years old:—

	$ cts.	$ cts.
Sow—		
Skimmilk, one-half; peas, oats and barley, one-half; 480 pounds at 1·3 cent	6 24	
Skimmilk, 240 pounds at ·25 cent	62	
Mangels (whole) 500 pounds at ·25 cent	75	7 61
Litter (pigs farrowing in winter) 6 months—		
Mixed grain (chops, peas, oats and barley), 350 pounds at 1·3 cent	4 56	
Skimmilk, 240 pounds at ·25 cent	60	
Mangels (whole), 750 pounds at ·25 cent	1 87	6 11
Litter (pigs after weaning) 6 months—		
Skimmilk, 240 pounds at ·25 cent	0 87	
Mixed chops, 70 pounds at 1·3 cent	91	1 78
Total cost of food for sow and litter		15 50
Average number of pigs raising litter		
Average cost per pig raised		1 55

Aver-

EXPERIMENT ON THE EFFECTS OF FEEDING RICE-MEAL TO FATTENING HOGS.

In the annual report for the year ending March 31, 1913, some preliminary experiments were described on the value of rice-meal as a food for swine.

This work was undertaken in response to numerous inquiries received from this section of the province concerning this food, it being evident that large quantities of rice-meal were being sold to farmers. The work done was of a preliminary nature and was necessarily not conclusive; but it indicated that further careful experiment was both desirable and necessary in order to prove: Firstly, whether this food was a profitable one for farmers to feed to pigs; and secondly, what was its effect on animal nutrition.

With these two main objects in view, a number of experiments have been carried on for the past twelve months. Twenty-five pens of four pigs each, a total of one hundred pigs, have been fed. The feeding period varied from fifty-seven days to one hundred days, but the majority of the pens were fed for the last-named period. The pigs used were, as nearly as possible, of uniform size, age, and condition for each experiment. In every case the best pigs were put on the rice-meal or mixture and the poorer ones used for controls.

All the pigs on the experiment were given every attention that our condition would permit. They were kept in rough, but light, clean, well-bedded, and well-ventilated pens. The pens were cleaned out every day and fresh straw was put in. They were fed three times a day, and were given clean water to drink at will. Green food, such as mangels, peas, oats and vetches, and green clover, was supplied every day. Three times each week, every pen was supplied with a liberal quantity of a mixture of soil, wood-ashes, charcoal, and salt. This mixture was greatly enjoyed by all the pigs.

The pigs used were very ordinary in breeding and condition. Grade and cross-bred pigs were bought and these were supplemented from our own litters by pure-bred ones that were not first-class breeding stock. They were always so arranged as to make the pens as uniform as possible.

In all the work now reported, rice-meal when fed in mixtures was used half and half with other meals, except alfalfa and dried blood. These last named foods were used in an endeavour to replace skim-milk. Dried blood at $60 per ton, and ground alfalfa at $28 per ton were both very expensive substitutes for skim-milk.

Thirteen pens were fed rice-meal and rice-meal mixtures. Twelve pens were used as controls and fed on wheat shorts, or shorts and the same mixtures as in the case of rice-meal. The different lots contain both summer- and winter-fed hogs.

In looking over the various lots of pens, one will notice quite a variation in the different points, but in every case the rice-meal fed hogs were less profitable than were the ones fed on the other grains. Not only were they less profitable but their general condition was not to be compared to the control pens. In some cases a definite disease developed, and when the hogs were slaughtered they were condemned on account of lack of condition.

Dr. Seymour Hadwen of the Health of Animals Branch inspected, both before and after slaughter, every hog put through the pens. As will be noted in a paragraph by Dr. Hadwen, this malady caused by the rice-meal resembles very closely the disease Beri-beri in man. When this trouble first occurred, it appeared due to some faulty method of housing or feeding; but, when experience proved that this malady could be produced or checked at will by changing the ration, this idea was given up. In every case where rice-meal has been fed, symptoms were produced of a like nature. This has been done with various classes of hogs at all seasons of the year, and with various foods mixed with rice-meal.

AGASSIZ

The grain foods used varied in price, and each pen was charged according to the food eaten. The prices charged were as follows:—

	Per Ton.
Wheat shorts	$26 00 to $28
Rice meal	22 40 to $25
Peas, oats and barley (home grown)	26 00
Crushed alfalfa	28 00
Dried blood	60 00
Mangels and green feed	4 00
Skimmilk	4 00
Potatoes (culls)	4 00

Lots 1 and 2.

In lot 1, all the pens were fed rice-meal as the grain ration, and all the pens in lot 2 were fed wheat shorts as a control. This experiment was made in the different seasons of the year, and the average represents all of our yearly conditions.

It will be noted that the periods vary in length. This irregularity was brought about by the rice-meal fed pigs becoming disabled and being killed when they began to lose weight. At the same time, the controls were gaining rapidly and had not yet reached the height of their production. This, to a great extent, lessens the difference between the two lots, but, even at this stage, there is more profit to the credit of the controls.

From a nutrition point of view, the difference is very marked. In pen 1, the pigs all became very stiff and sore and refused food at fifty days; their hair was rough and the skin yellow to brown. Pen 5, at a different season of the year, also went exactly the same way at the fifty-day stage. Pen 10 started to show symptoms of trouble at thirty days, and at fifty days the pigs were all unable to use their hind-feet and had very rough hair and brown skins. This pen was treated with Epsom salts, given shorts to eat, and in a few days they were on their feet. They were put back on rice-meal and all stiffened up again, becoming very bad before the period was up. They were all condemned before killing. Pen 12 had a slightly different history. At fifty-three days, one pig became very lame very suddenly as if attacked by a terrible cramp in the hind legs. He was exceedingly sore and noisy. Three days later the other pigs became gradually lame. All of them had very rough hair and dark skins. They gradually became worse until the end of the period. The first symptom one would notice was a uniform wild or staring expression of the eyes, next they would not clean their trough out, then they would get stiff and bury themselves in the straw and they would squeal vehemently if disturbed.

In contrast to this, there was no trouble at all with the pigs in lot 2, fed on straight shorts with all the other conditions exactly the same. In pen 2 the pigs were healthy and active every day, although they became very fat, and they were always hungry. Their trough was always clean, their skin and hair were pure white and they were making their best gains at the end of the period. Pen 6 has exactly the same history as pen 2, only that they started as much younger pigs and ran a longer period. Pen 9 started very young and ran the full 100 days, without the slightest trouble occurring. They varied from the other two pens in this lot because they were pushed to the limit throughout the trial. They were given every pound of shorts they would possibly eat, yet they never refused a meal or had anything wrong with them, except that they became very fat.

Several times during the various periods, the pigs changed places with one another to try to prove whether or not there was any difference in location in the piggery or anything contagious, but negative results were obtained at each time. The ration was the only factor in changing the condition. From the results obtained from lots 1 and 2, it must be said that rice-meal is not a safe food for fattening hogs.

AGASSIZ.

Lot 1.—Rice-Meal, Skim-milk, and Mangels.

	Lot 1.				
	Pen 1.	Pen 5.	Pen 10.	Pen 12.	Average.
Number of animals	4	4	4	4	4
Age at beginning of feeding period ..... days.	180	98	70	98	111 5
Total weight at beginning of feeding period. lb.	582	324	201	249	339·
Nutritive ratio of ration	1:7·9	1:7·54	1:7·85	1:8·03	1:7·83
Duration of feeding period..... days.	57	78	100	100	83·75
Amount of meal consumed..... lb.	684	705	1291	1112	948
Amount of milk consumed..... "	570	780	1000	1000	837·5
Amount of mangels consumed..... "	1425	1560	1000	1000	1246·25
Amount of meal consumed for 100 pounds gain..... "	412·05	329·4	369·91	376·9	372·065
Amount of milk consumed for 100 pounds gain "	343·3	364·48	286·5	338·98	333·315
Amount of mangels consumed for 100 pounds gain ..... "	858·43	728·9	286·5	338·98	553·202
Cost to produce 100 pounds gain..... $	7·28	6·11	5·77	6·05	6·30
Total live weight at end of feeding period... lb.	748	538	550	544	595
Total gain in live weight during feeding period..... "	166	214	349	295	256
Daily gain per pig during feeding period.... "	·728	·685	·872	·737	·7555
Total weight of viscera... "	105	81·6	96·6	73.8	89·25
Weight of livers..... "	14.3	9·9	8·1	8·4	10·175
Weight of hearts and lungs..... "	9·3	7·5	8·6	8·1	8·375
Weight of remainder of viscera..... "	81·4	64·2	77·9	57·3	70·2

Lot 2.—Wheat Shorts, Skim-milk, and Mangels.

	Lot 2.			
	Pen 2.	Pen 6.	Pen 9.	Average.
Number of animals.....	4	4	4	4
Age at beginning of feeding period..... days.	180	98	70	116
Total weight at beginning of feeding period.. lb.	449	322	198	323
Nutritive ratio of ration	1:4.21	1:4.14	1:4.12	1:4.117
Duration of feeding period..... days.	64	78	100	80·66
Amount of shorts consumed..... lb.	768	696	1,339	934·3
Amount of milk consumed..... "	640	780	940	786·6
Amount of mangels consumed..... "	640	1,560	940	1,046·6
Amount of shorts consumed for 100 pounds gain ..... "	269·4	214·15	299·5	261·01
Amount of milk consumed for 100 pounds gain "	224·5	240	210·2	224·9
Amount of mangels consumed for 100 pounds gain..... "	224·5	480·	210·2	304·9
Cost to produce 100 pounds gain..... $	4.39	4.10	4.73	4·306
Total live weight at end of feeding period.... lb.	734	617	645	675·3
Total gain in live weight during feeding period "	285	325	447	352·3
Daily gain per pig during feeding period..... "	1·113	1·04	1·117	1·09
Total weight of viscera..... "	92·5	76·8	112·	93·76
Weight of livers..... "	14·6	12·6	13·7	13·63
Weight of hearts and lungs..... "	11·	8·2	10·1	9·76
Weight of remainder of viscera..... "	66·9	56	88·2	70·36

Lot 3 and 4.

In lots 3 and 4, wheat shorts was used for the foundation ration. Lot 3 had one-half of the grain food made up of rice-meal and lot 4 had an equal portion of a home-grown mixture of oats, peas, and barley. This experiment was made to determine what effect rice-meal would have as compared with mixed grain, when used with equal

portions of wheat shorts. Speaking generally from the results obtained, the mixture of rice-meal and shorts is very little better than straight rice-meal and cannot be compared in regard to usefulness with oats, peas, barley, and shorts.

The same trouble was experienced in lot 3 as in lot 1, but it did not occur quite as early in the feeding period. The history of lot 3 is as follows: In pen 3, the pigs became fat but looked rough and had dark-coloured skins, but they did not show signs of weakness in the hind-legs until the eighty-third day, after which time they all went down and they were immediately killed. Pen 7 of this lot showed the first symptoms of trouble at fifty days, and at the 64th-day stage none could walk, and they were killed before they had finished their 100-day period.

The controls in lot 4 behaved very differently. Pen 4 did not begin to gain as rapidly as did pen 3 in lot 3, but the pigs always appeared in better condition. The last week of the period they made better gains than in any previous week. They were killed the same time as pen 3 of lot 3, and thus lost, to the advantage of that pen, their last feeding period. They never missed a meal; they were always hungry, and were in perfect health when killed. The pigs in pen 8, lot 4, were from the same litter as those in pen 7, lot 3, and were 2 pounds heavier at the beginning, but the pen 7 pigs were the most robust looking. Instead of killing this pen when the ones they controlled went under, they were kept the full period to see if, by any chance, they could be pushed off their feet. At the end of 105 days, or 41 days longer than their rice-meal mates, they were still healthy and in perfect condition.

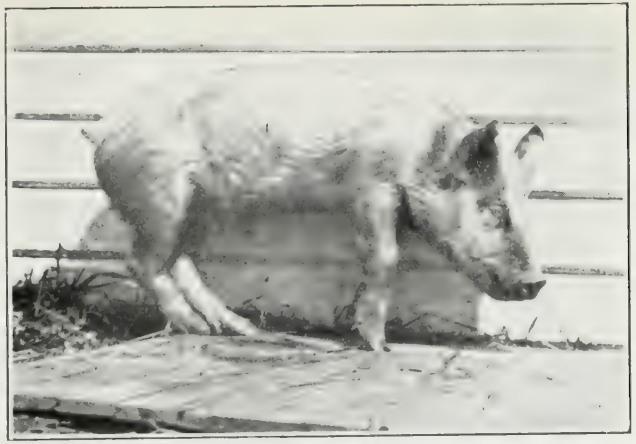
The same can be said of pen 15. They started slowly, grew for a long time, then began to fatten, and, for the whole period, they were in perfect health and were in show condition when killed.

Comparing lots 3 and 4, the cost of production differs but little. Lot 3 could only stand, on an average, 77·5 days' feeding; while lot 4 averaged 98·6 days and gave first-class block pork, as compared to having lot 3 pork condemned. This makes the very great difference in the two lots.

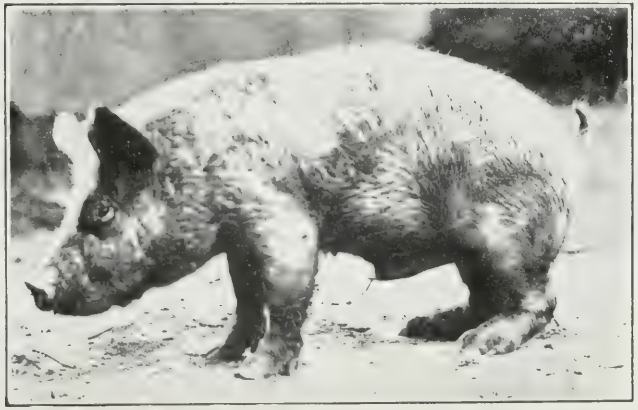
Lot 3.—Rice-meal, Wheat Shorts, Skim-milk, and Mangels.

		Lot 3.		
		Pen 3	Pen 7.	Average
Number of animals		4	4	4
Age at beginning of feeding period	days	98	84	91
Total weight at beginning of feeding period	lb.	271	202	236·5
Nutritive ratio of ration		1 : 5·6	1 : 5·5	1 : 5·55
Duration of feeding period	days	91	64	77·5
Amount of meal consumed	lb.	447	288	367·5
Amount of shorts consumed	lb.	447	288	367·5
Amount of milk consumed	lb.	920	640	780
Amount of mangels consumed	lb.	910	1,280	1,095
Amount of meal consumed for 100 pounds gain	lb.	111·45	150	130·725
Amount of shorts consumed for 100 pounds gain	lb.	111·45	150	130·725
Amount of milk consumed for 100 pounds gain	lb.	229·4	333·33	281·365
Amount of mangels consumed for 100 pounds gain	lb.	226·9	666·66	446·78
Cost of gain per 100 pounds gain	$	3 75	5 65	4 70
Total live weight at end of feeding period	lb.	672	394	533
Total gain in live weight during feeding period	lb.	401	192	296·5
Daily gain per pig during feeding period	lb.	1·1	·75	·925
Total cost of shorts	$	109·8	47·8	78·8
Weighed lbs.		13	10·1	11·55
Weight of heads and legs	lb.	10·5	6·4	8·45
Weight of remainder of carcass	lb.	86·3	31·3	58·8

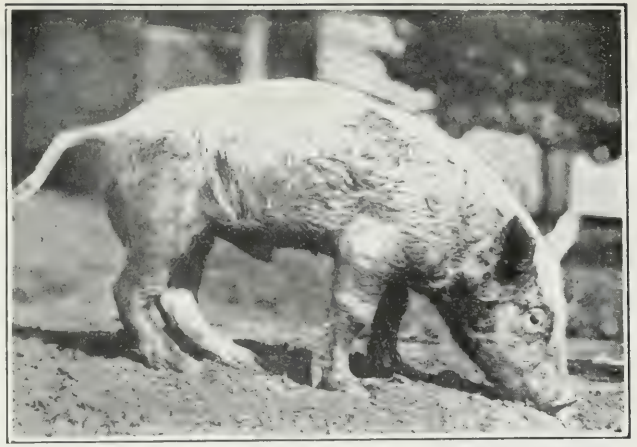
Average



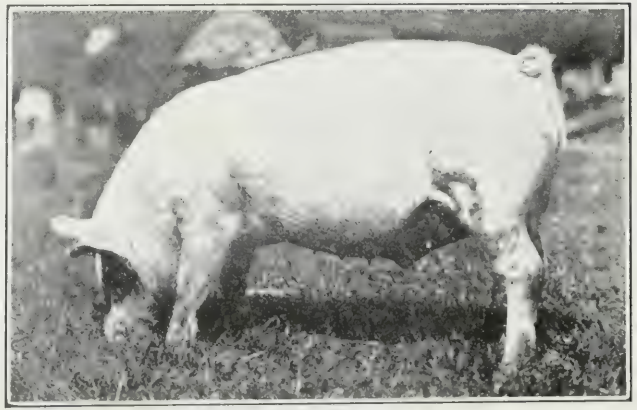
Pig from lot 7, pen 22. Fed rice meal, dried blood and mangels.



Pig from lot 7, pen 22. Fed rice meal, dried blood and mangels.



Pig from lot 7, pen 22. Fed rice meal, dried blood and mangels.



Pig from lot 8, pen 24. Fed on wheat shorts, chop and dried blood.

Lot 4.—Oats, Peas and Barley, Wheat Shorts, Skim-milk, and Mangels.

		Lot 4.			
		Pen 4.	Pen 8.	Pen 15.	Average.
Number of animals		4	4	4	4
Age at beginning of feeding period	days.	98	84	98	93·3
Total weight at beginning of feeding period	lb.	248	204	234	228·6
Nutritive ratio of ration		1:4·47	1:4·7	1:4·5	1:4·556
Duration of feeding period	days.	91	105	100	98·6
Amount of grain consumed	lb.	447	550·5	742·5	580
Amount of shorts consumed	"	447	550·5	742·5	580
Amount of milk consumed	"	920	1,050	1,000	990
Amount of mangels consumed	"	910	2,120	1,000	1,343·3
Amount of grain consumed for 100 pounds gain	"	114·6	131·07	173·48	139·71
Amount of shorts consumed for 100 pounds gain	"	114·6	131·07	173·48	139·71
Amount of milk consumed for 100 pounds gain	"	235·8	250	233·6	239·8
Amount of mangels consumed for 100 pounds gain	"	233·33	504·76	233·6	323·896
Cost to produce 100 pounds gain	$	3 92	4 72	5 34	4 66
Total live weight at end of feeding period	lb.	638	624	662	641·3
Total gain in live weight during feeding period	"	390	420	428	412·6
Daily gain per pig during feeding period	"	1·09	1	1·07	1·053
Total weight of viscera	"	93·7	87	89·9	90·2
Weights of livers	"	12	11·9	13	12·3
Weight of hearts and lungs	"	10·3	10·1	9·3	9·9
Weight of remainder of viscera	"	71·4	65	67·6	68

Lot 5 and Lot 6.

In lots 5 and 6, ground alfalfa was substituted for skim-milk, and rice-meal was tried against the common grain mixture. The rations for both lots were of a bulky nature, yet they were eaten well, especially the control. The pigs on the control ration had not the smooth, fine finish of the milk-fed hogs, and the gain was costly.

Pen 13, lot 5, had very rough coats of hair and dark-coloured skins, and they grew very rough. After being fed for fifty-four days, one pig showed signs of stiffness, but it was several days longer before all the rest lost control of their hind-legs. This pen did not get as bad as previous rice-meal fed pens, and the pigs got about the pen to feed until the end of the period. Pen 23, lot 5, did not stand up so well, for in thirty-one days one pig was crippled. Gradually others went down, until, after sixty days, three pigs were stiffened up and very sore. One pig showed no signs of stiffness whatever during the entire period. He ate fairly well, had rough hair, and did not grow, but he remained on his feet the entire period. Just at the end, he had the peculiar staring expression, and his head was much out of proportion to the rest of his body.

In lot 6, pen 16 was not an extra good control, because two pigs when started had become runted and the rough ration did not improve them. All the pigs in this pen had an enormous appetite and they were given all they would eat. They were killed early, but were in perfect health, with the exception of one pig which had adhesions between the lungs and ribs.

Pen 25 of this lot was made up of much better pigs. They ate greedily and remained healthy throughout the entire period.

In these lots, even with poor pigs as controls, the rough grains were far superior to the rice-meal. The lack of milk made a great difference in the condition of the pigs.

Lot 5.—Rice-meal, Ground Alfalfa, and Mangels.

		Lot 5.		
		Pen 13.	Pen 23.	Average.
Number of animals		4	4	4
Age at beginning of feeding period	days.	98	120	109
Total weight at beginning of feeding period	lb.	249	316	282·5
Nutritive ratio of ration		1:9·29	1:8·9	1:9·095
Duration of feeding period	days.	100	100	100
Amount of meal consumed	lb.	1,197	909	1,053
Amount of alfalfa consumed	"	115	131	123
Amount of mangels consumed	"	1,000	1,000	1,000
Amount of meal consumed for 100 pounds gain	"	357·05	683·45	507·25
Amount of alfalfa consumed for 100 pounds gain	"	34·82	98·4	66·11
Amount of mangels consumed for 100 pounds gain	"	294·1	751	522·55
Cost of producing 100 pounds gain		5·32	11·047	8·1835
Total gain in live weight during feeding period	lb.	589	449	519
Total gain in live weight during feeding period	"	340	133	236·5
Daily gain per pig during feeding period	"	·85	·33	·59
Total weight of carcass	"	93·7	71·2	82·45
Weight of livers	"	12·4	6·6	9·5
Weight of hearts and lungs	"	7·8	8·2	8
Weight of remainder of carcass	"	73·5	56·4	64·95

Lot 6.—Wheat Shorts, Peas, Oats and Barley, Ground Alfalfa, Mangels.

		Lot 6.		
		Pen 16.	Pen 25.	Average.
Number of animals		4	4	4
Age at beginning of feeding period	days.	119	131	125
Total weight at beginning of feeding period	lb.	366	333	349·5
Nutritive ratio of ration		1:5·4	1:4·8	1:5·1
Duration of feeding period	days.	50	100	75
Amount of shorts consumed	lb.	490·5	621·5	556
Amount of grain consumed	"	490·5	621·5	556
Amount of ground alfalfa consumed	"	123	150	136·5
Amount of mangels consumed	"	560	1,185	842·5
Amount of shorts consumed for 100 pounds grain	"	245·25	206·4	225·825
Amount of grain consumed for 100 pounds gain	"	245·25	206·4	225·825
Amount of ground alfalfa consumed for 100 pounds gain	"	61·5	49·83	55·665
Amount of mangels consumed for 100 pounds gain	"	250	393·6	321·8
Cost of producing 100 pounds gain	$	7·48	6·53	7·005
Total live weight at end of feeding period	lb.	566	634	600
Total gain in live weight during feeding period	"	200	301	250·5
Daily gain per pig during feeding period	"	1	·835	·9175
Total weight of carcass	"	101·3	92·1	96·7
Weight of livers	"	11·1	9·2	10·15
Weight of hearts and lungs	"	7·5	11·6	9·55
Weight of remainder of carcass	"	81·7	71·3	76·5

Lot 7 and Lot 8.

With these two lots, dried blood was used as a substitute for skim milk, combined with the same grains as in lots 5 and 6.

The dried blood made a much better substitute for skim-milk than did the ground alfalfa, but, even by making the ration much narrower, it did not prevent the trouble with rice-meal.

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In the rice-meal lot (No. 7), pen 14 showed the typical symptoms in sixty-two days, and at eighty-two days one pig was absolutely helpless and the rest badly crippled. They remained in this condition until the end of the period. Pen 22 was made up of very excellent, strong pigs, but at thirty days one pig showed signs of weakness, and at thirty-eight days, all showed dark-coloured skins and stiffness. At fifty days all were alike and crippled.

Lot 8 was very different. Both pens remained in perfect health until the end of the period and they were clean and smooth, although not as smooth as pigs getting skim-milk. The high price of the dried blood meal made the gain more expensive than it otherwise would have been. The pigs in both lots were very even and among the very best used.

Lot 7.—Rice meal, Dried Blood and Mangels.

		Lot 7.		
		Pen 14.	Pen 22.	Average.
Number of animals		4	4	4
Age at beginning of feeding period	days.	98	127	112.5
Total weight at beginning of feeding period	lb.	238	299	268.5
Nutritive ratio of ration		1 : 5 8	1 : 5.6	1 : 5.7
Duration of feeding period	days.	100	100	100
Amount of meal consumed	lb.	1159	893	1026
Amount of dried blood consumed	"	97	85	91
Amount of mangels consumed	"	1000	1000	1000
Amount of meal consumed for 100 lbs. gain	"	375.08	572 46	473.77
Amount of dried blood consumed for 100 lbs. gain	"	31.39	54.4	42.895
Amount of mangels consumed for 100 lbs. gain	"	323 62	641.	482.31
Cost to produce 100 lbs. gain	$	6.10	9.74	7.92
Total live weight at end of feeding period	lb.	547	455	501
Total gain in live weight during feeding period	"	309	156	232.5
Daily gain per pig during feeding period	"	.77	.39	.58
Total weight of viscera	"	86.7	79.3	83.
Weight of livers	"	10.2	6 6	8.4
Weight of hearts and lungs	"	7.6	9.1	8 35
Weight of remainder of viscera	"	68.9	63.6	66.25

Lot 8.—Wheat shorts, Oats, Peas and Barley, Dried Blood, and Mangels.

		Lot 8.		
		Pen 17.	Pen 24.	Average.
Number of animals		4	4	4
Age at beginning of feeding period	days	98	129	113·5
Total weight at beginning of feeding period	lb.	241	305	273
Nutritive ratio of ration		1 : 5·6	1 : 3·5	1 : 4·56
Duration of feeding period	days	100	100	100
Amount of shorts consumed	lb.	760·5	656·5	708·5
Amount of grain consumed	"	760·5	656·5	708·5
Amount of dried blood consumed		97	100	98·5
Amount of mangels consumed		1,000	1,185	1,092·5
Amount of shorts consumed for 100 pounds gain		566·5	205·15	285·825
Amount of grain consumed for 100 pounds gain		566·5	205·15	285·825
Amount of dried blood consumed for 100 pounds gain		23·37	31·25	27·31
Amount of mangels consumed for 100 pounds gain		240·96	370·3	305·63
Cost of produce 100 pounds gain	$	5·35	6·72	6·035
Total live weight at end of feeding period	lb.	656	625	640·5
Total gain in live weight during feeding period	"	415	320	367·5
Daily gain per pig during feeding period	"	1·03	·8	·915
Total weight of viscera	"	87·3	89·	88·15
Weight of liver	"	11·7	9·5	10·6
Weight of hearts and lungs	"	8·3	7·9	8·1
Weight of remainder of viscera	"	67·3	71·6	69·45

Lot 9 *vs.* Lot 10.

In lots 9 and 10, rice-meal was used against wheat shorts in a mixture of ground alfalfa and dried blood as a substitute for skim-milk. This trial was made to see if using one grain alone with the skim-milk substitute would have any effect on the control pigs. Both pens were fed all they could possibly eat three times a day, and no economy was practised, but with all the results were very similar to all the other work.

In pen 18, lot 9, one pig stiffened up after thirty-six days' feeding, and at sixty days all the pigs were diseased and were very rough-looking in hair and skin. They were kept on the remaining forty days, and, when killed, they were condemned. Pen 19, lot 10, did not miss a meal during the entire period. The pigs got very fat but they were in perfect health until the end.

Although lot 9 had the best balanced ration, containing rice-meal, which had been fed up until this time, and lot 10 had an absolutely narrow one, the evidence is very much against the rice-meal. Even when the other foods were abused by thus combining them, they failed to produce the disastrous results obtained in lot 9. It must be added that although the meat produced in lot 10 was very tender and sweet, the fat was soft and oily, but of good flavour.

Lot 9.—Rice meal, Ground Alfalfa, Dried Blood, and Mangels.

Lot 9—Pen 18.

Number of animals		4
Age at beginning of feeding period	days.	105
Total weight at beginning of feeding period	lb.	263
Nutritive ratio of ration		1:5.6
Duration of feeding period	days.	100
Amount of meal consumed	lb.	1,181
Amount of alfalfa consumed	"	100
Amount of dried blood consumed	"	100
Amount of mangels consumed	"	1 000
Amount of meal consumed for 100 pounds gain	"	434·19
Amount of alfalfa consumed for 100 pounds gain	"	36·76
Amount of dried blood consumed for 100 pounds gain	"	36·76
Amount of mangels consumed for 100 pounds gain	"	367·6
Cost to produce 100 pounds gain	$	7.76
Total live weight at end of feeding period	lb.	535
Total gain in live weight during feeding period	"	272
Daily gain per pig during feeding period	"	·68
Total viscera, weight of	"	92·6
Weight of livers	"	10·7
Weight of hearts and lungs	"	6·2
Weight of remainder of viscera	"	75·7

Lot 10.—Wheat Shorts, Ground Alfalfa, Dried Blood, and Mangels.

Lot 10—Pen 19.

Number of animals		4
Age at beginning of feeding period	days	105
Total weight at beginning of feeding period	lb.	253
Nutritive ratio of ration		1 : 3.3
Duration of feeding period	days.	100
Amount of shorts consumed	lb.	1431
Amount of alfalfa consumed	"	100
Amount of dried blood consumed	"	100
Amount of mangels consumed	"	1000
Amount of shorts consumed for 100 pounds gain	"	357·75
Amount of alfalfa consumed for 100 pounds gain	"	25·
Amount of dried blood consumed for 100 pounds gain	"	25·
Amount of mangels consumed for 100 pounds gain	"	250·
Cost to produce 100 pounds gain	$	6.12
Total live weight at end of feeding period	lb.	653
Total gain in live weight during feeding period		400
Daily gain per pig during feeding period	"	1·
Total weight of viscera	"	102·2
Weight of livers	"	12·9
Weight of hearts and lungs	"	9·5
Weight of remainder of viscera	"	79·8

Lot 11 *vs.* Lot 12.

With lots 11 and 12, rice-meal was used against wheat shorts, both being mixed with boiled potatoes, skim-milk, and mangels.

The pigs were very even in size, type, and condition, at the beginning, and the pens contained two sows and two barrows each; these were grade Yorkshires. With these two lots, there was a repetition of all previous trouble which was caused by rice-meal. The two rations are probably the most common ones in this section, and, since doing this work, we have learned that other feeders have experienced similar trouble.

In the rice-meal lot (No. 12), pen 21, the pigs showed signs of disease after thirty-four days. One pig took very violent cramps, the same as a pig in lot 1, pen 12. In a short time the three remaining pigs were attacked in the same way. They would

and hobble about for a few days and then have a relapse. From the ninetieth to the hundredth day, they were totally disabled. All were condemned and some kept for veterinary examination. Their skins and hair were in very bad condition.

The pigs of lot 11, pen 20, were in elbow condition from the first. They got fat but ate greedily and never missed a meal nor showed any signs of being uncomfortable. When killed, the pork was thick but firm, and was an excellent quality of block pork.

Lot 11.—Wheat shorts, Boiled potatoes, Skim-milk, and Mangels.

		Lot 11.—Pen 20.
Number of animals		4
Age at beginning of feeding period	Days	98
Total weight at beginning of feeding period	lb.	237
Nutritive ratio of ration		1 : 4·5
Duration of feeding period	days	100
Amount of shorts consumed	lb.	1,311
Amount of potatoes consumed	"	876
Amount of milk consumed	"	1,000
Amount of mangels consumed	"	1,000
Amount of shorts consumed for 100 pounds gain	"	316·6
Amount of potatoes consumed for 100 pounds gain	"	211·5
Amount of milk consumed for 100 pounds gain	"	241·5
Amount of mangels consumed for 100 pounds gain	"	241·5
Cost to produce 100 pounds gain	$	5.18
Total live weight at end of feeding period	lb.	651
Total gain in live weight during feeding period	"	414
Daily gain per pig during feeding period	"	1·035
Total weight of viscera	"	111·6
Weight of liver	"	12·7
Weight of hearts and lungs	"	6·2
Weight of remainder of viscera	"	92·7

Lot 12.—Rice-meal, Boiled potatoes, Skim-milk, and Mangels.

		Lot 12. Pen. 21.
Number of animals		4
Age at beginning of feeding period	Days.	112
Total weight at beginning of feeding period	lb.	237
Nutritive ratio of ration		1 : 8·1
Duration of feeding period	Days	100
Amount of meal consumed	lb.	853
Amount of boiled potatoes consumed	"	790
Amount of milk consumed	"	1,000
Amount of mangels consumed	"	1,000
Amount of meal consumed for 100 pounds gain	"	364·5
Amount of potatoes consumed for 100 pounds gain	"	337·6
Amount of milk consumed for 100 pounds gain	"	427·3
Amount of mangels consumed for 100 pounds gain	"	427·3
Cost to produce 100 pounds gain	$	6.75
Total live weight at end of feeding period	lb.	471
Total gain in live weight during feeding period	"	234
Daily gain per pig during feeding period	"	·585
Total weight of viscera	"	37·3
Weight of liver	"	4·6
Weight of hearts and lungs	"	3·1
Weight of remainder of viscera	"	29·6
(Weights of viscera are those of 2 pigs only).		

LOT 13 AND LOT 14.

These two lots might be classed together as one, for the same pigs were used in both lots on two different rations. They were started in lot 13, pen 11, and were fed on rice-meal, skim-milk, and mangels. On this ration they became crippled and the ration was changed to oats, peas, and barley (lot 14, pen 11).

At fifty-one days from the beginning of the period, all of the pigs went off their feed and all but one became very stiff and sore. The three got extremely sore, and squealed vehemently when approached. Thy could not rise, but would drink water when lifted to the trough; their skins were yellow and their hair rough. After working with them in this condition for three weeks, the food was changed, and three days after the change the pigs could rise and make an attempt at walking. The three which were attacked the worst were horrible-looking specimens and were greatly emaciated. As soon as they could walk reasonably well, which took about a week, they began to eat greedily of the oats, peas, and barley ration, results of which are seen in period "B."

Although they were only kept on the oats, peas, and barley ration for twenty-two days, they made a greater daily gain and a cheaper gain than they did in the previous period, and almost completely recovered from the disease. There was not anything in the weather or conditions (outside of the ration), to help out in this change, because at the same time that this pen was recovering, other pens were developing the disease.

LOT 13.—Rice-meal, Skim-milk, and Mangels.

		LOT 13.
		Pen 11, (Period "A").
Number of animals		4
Age at beginning of feeding period	Days	70
Total weight at beginning of feeding period	lb.	205
Nutritive ratio of ration		1: 7 56
Duration of feeding period	Days.	78
Amount of meal consumed	lb.	841
Amount of milk consumed	"	780
Amount of mangels consumed	"	780
Amount of meal consumed for 100 pounds gain	"	357·87
Amount of milk consumed for 100 pounds gain	"	331·9
Amount of mangels consumed for 100 pounds gain	"	331·9
Cost to produce 100 pounds gain	$	5.78
Total live weight at end of feeding period	"	440
Total gain in live weight during feeding period	"	235
Daily gain per pig during feeding period	"	·75

Lot 14.—Peas, Oats and Barley, Skim-milk, and Mangels.

		Lot 14.
		Pen 11, (Period "B").
Number of animals		4
Age at beginning of feeding period	days.	148
Total weight at beginning of feeding period	lb.	440
Nutritive ratio of ration		1: 5·9
Duration of feeding period	days.	22
Amount of grain consumed	lb.	311
Amount of milk consumed	"	220
Amount of mangels consumed	"	220
Amount of grain consumed for 100 pounds gain	"	287·9
Amount of milk consumed for 100 pounds gain	"	203·7
Amount of mangels consumed for 100 pounds gain	"	203·7
Cost to produce 100 pounds gain	$	4·47
Total live weight at end of feeding period	lb.	548
Total gain in live weight during feeding period	"	108
Daily gain per pig during feeding period	"	1·227
Total weight of viscera	"	85·8
Weight of livers	"	10·4
Weight of hearts and lungs	"	7·4
Weight of remainder of viscera	"	68

SUMMARY.

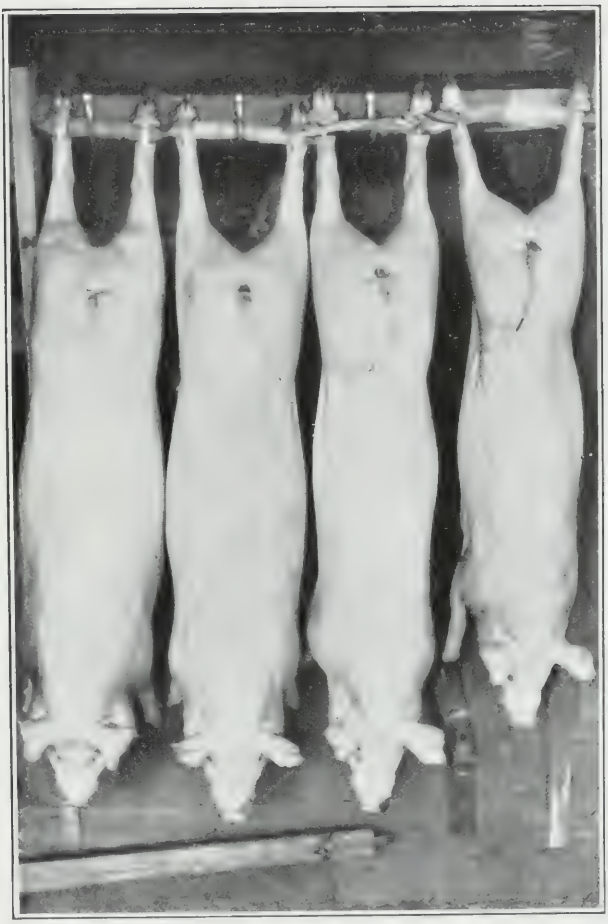
This concludes the work finished this year, but at the time of writing there are quite a number of pens still under test. The present condition of these would lead one to think that more evidence is soon to be available. Further work is being done in the feeding of rice-meal, with the object of finding out the cause of the trouble described. There has always been a variation in quality of the different shipments of rice-meal. Thus, though the ill effects of this product varied in intensity and in time of appearance, yet they all eventually resulted in the same condition.

In concluding this report, at the present stage of the work, one is forced to say that rice-meal is not a profitable food for fattening young hogs. Whether used alone or in mixtures, whether bought cheaply or otherwise, it is not as profitable as the grains grown or other common foods that can be obtained in this section. For fattening hogs it was not only unprofitable but caused absolute loss. When fed for one hundred days or more, it produced a definite state of malnutrition. More than this, it caused an actual disease, which could be intensified or checked at will by change of diet. It would seem that the ill effects of rice-meal were due to its chemical rather than its physical composition, since control rations of much rougher physical composition were used, and these failed to produce any bad effects.

In the trials made, rice-meal, when fed in mixtures, constituted half the grain. It is of course possible that, when fed in smaller proportions, it would have no ill effects. This, however, awaits proof. A pathological study of the disease produced reveals the fact that the symptoms and lesions are constant, and resemble those of beri-beri in human beings.

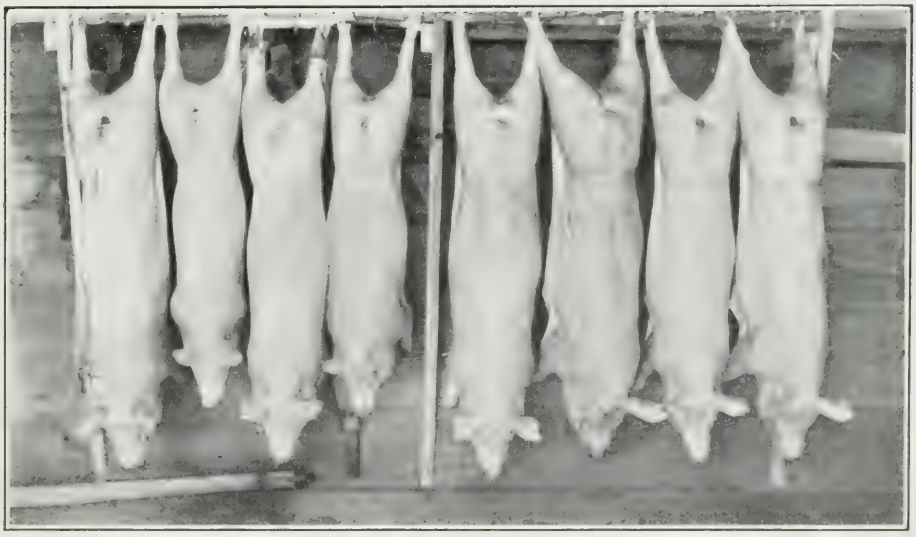
AGASSIZ.

Agassiz. Lot 6, Pen 25. Fed Wheat Shorts, Mixed Chop, Ground Alfalfa and Mangels.



Agassiz: Four pigs from one litter and equal weight at beginning of period. Two pigs on left were fed shorts and chop; two pigs on right were fed rice meal and chop. The two best pigs from their respective pens.

Lot 5, Pen 13. Fed Rice Meal, Ground Alfalfa and Mangels. The best pen fed on Rice Meal. Pig on right crippled; others only slightly so. On being let out they ate earth so fast that it was difficult to get even a snap shot of their heads. Note rough coats and dark colour.



Agassiz: Four pigs on left, lot 5, pen 13. Note unevenness in size and condition as compared to pigs on right, lot 6, pen 25.

SESSIONAL PAPER No. 16

A DISEASE SIMULATING BERI-BERI IN PIGS FED ON RICE-MEAL.

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During the course of the experiment, which Mr. Moore describes above, I was requested by him to undertake the pathological study of a disease in pigs produced by the feeding of rice-meal. This was sanctioned by Dr. F. Torrance, Veterinary Director General, and by Mr. J. H. Grisdale, Director of Experimental Farms, and the results of the work are here briefly given. The conditions of housing, feeding, watering, etc., are fully described in Mr. Moore's report, and I need concern myself only with the strictly pathological side of the question.

First, it seems necessary to say a word about the general health of the animals used in the feeding experiment. The stock came from perfectly healthy sires and dams. In addition, no disease of a contagious nature has appeared on the Farm since this laboratory was established, a period of three years. Breeding is carried on extensively here, and pigs are shipped to all parts of the province. No complaints on the score of ill-health have been received from any of the purchasers, a proof of the soundness of the stock. This proof is very necessary, since the disease I am about to describe might be mistaken for other affections. I was struck at first with the resemblance of the symptoms to those described for beri-beri in human beings, and all the evidence which has since come out strengthens this theory. I leave the reader to judge for himself the facts which have been gathered.

SYMPTOMS.

Mr. Moore had mentioned on several occasions that rice-meal was not a profitable food, and that his pigs were actually showing ill effects from its use. The first case I was called to examine was a young pig which the herdsman had just been weighing. In backing out of its crate it seemed to stumble or take a cramp. At least this was what the man in charge thought it was. He had been rubbing its leg to take the stiffness out, which seemed to cause it exquisite pain, as its squeals could be heard all over the Farm. At first it looked as though it might be a case of articular rheumatism, but later several more pigs showed similar symptoms. Most of these appeared suddenly, but a few were gradual in developing. They could be described as very painful lamenesses occurring almost invariably in the hind-legs. The pigs resented any attempt to handle them, an unusual occurrence in gentle pigs, which previously allowed one to do so with evident pleasure.

These painful lamenesses, together with a wild-staring expression are the first signs. Later a growing unthriftiness is noted. The animals lie buried in the straw and, after a time, are scarcely able to hobble to their trough. The skin and hair assumes a dirty colour. At first it was thought that this was simply a result of their lying so continuously, but this is not the case, because when a change of food is made the skin clears up rapidly. Emaciation appears in about two months and in some cases is very marked. In a few instances, though the pigs have not grown, they have not become actually thin. In some of the pigs heart-attacks have been quite common. They usually followed some slight exertion, such as walking over to the trough. The affected animal would give a cough or two and begin to breathe very heavily; its eyes would start out of its head and then it seemed to lose its breath; facial respiration continued. Then it would stiffen all its limbs and look as though it were going to die. After a time breathing would begin again. Some of the pigs have heart-attacks of this sort two or three times a day.

In advanced stages the gait became most uncertain and staggery. As one would expect in poorly nourished young animals, the bones became soft and rachitic. It is well to make an explanation here, that according to authorities on the subject, rickets is a non-painful affection, which fact separates it from the disease in question. Osler says that if there ever is pain it must be quite exceptional, that the "ricketty" symptoms which we have observed must be secondary, and the final and conclusive proof of this is that none of the controls ever showed any of these symptoms, though they were fed, housed, and cared for in exactly the same way, with the one exception that instead of rice-meal they were given other grains.

Again, as has been stated before, the attacks of lameness were for the most part sudden. A pig which had been quite active in the evening would be lame on the following morning. In rickets, on the other hand the symptoms, according to Moussu, are invariably insidious ("absolument insidieux.").

In the foregoing experiments the stiffness took, on an average, fifty days to appear; in two cases it was seen at about thirty days. The lameness is usually in the hind legs, just as beri-beri in human beings produces neuritis of the feet and legs. It is said that beri-beri is not so common in children as in adults; as all the pigs used were young, Mr. Moore intends to do some further experiments on older animals.

All possibility that the disease might be contagious was eliminated early in the course of the experiment. Healthy control pigs were moved into pens which had lately been occupied by the diseased animals, no attempt at disinfection being made. None of these pigs ever showed any symptoms or ill effects.

It is important to emphasize the fact that when rice-meal was discontinued, and other grains substituted, the pigs recovered.

PATHOLOGY.

The pathological findings confirmed the resemblance of the disease to beri-beri. Temperature records of both healthy and control pigs have been kept and no important rises of temperature have ever been recorded. The average temperature of control pigs for a 43-day period, commencing in the middle of a test, was 102·5° F., that of rice-meal pigs for the same period, 101·4° F. The lower average in the case of the rice-meal fed pigs was due to the temperatures becoming sub-normal in the latter part of the experiment, when they fell as low as 99° F.

The pathological changes seen in the pigs fed for one hundred days were as a rule insignificant. There was, however, one lesion which was almost constant, a congestion of the duodenum, and a catarrhal, bile-stained condition of the lower end of the stomach. Thirteen pigs were kept over the hundred-day period; post mortem examinations were made on them and in these the lesions were much more marked. Four of these showed well-marked pericarditis and adhesions. In nearly all cases there was a considerable amount of fluid in the pericardial sac. The hearts were soft and flabby. Accompanying the heart lesions an oedematous condition of the lungs was seen. In one case gastric or peptic ulcers were encountered, and all but two showed congestion of the duodenum and a catarrhal condition of the stomach. Though other lesions were looked for in the viscera, none was encountered.

The bones were very soft, with the exception of four cases, where shorts had been substituted for rice-meal for about a fortnight. In these it was noticeable that the bone was getting harder. In the other cases the bone could be readily cut with a knife.

The blood was thin in the advanced cases, but in the differential count no variation from the normal was observed. The urine, removed from the bladders of three pigs after death, in one showed no albumen and in the other two small amounts. The muscles of the affected pigs were soft. The fat was slow in setting and in some did not set at all well.

AGASSIZ.

According to Manson and Osler, the most characteristic lesions of beri-beri in man are: Hydropericardium, oedema of the lungs, and inflammation of the duodenum, degeneration of the nerves, and atrophy of the muscles. So that it seems evident that we are dealing with a very closely allied disease.

ETIOLOGY.

It is well-known that certain rice products produce beri-beri. It was evident that the different lots of pigs under experiment took the disease after a longer or shorter period of feeding. As different shipments of rice-meal were used, it appeared that there was a variation in its toxic properties. The exact nature of this harmful property remains to be proved. Caspari and Mozkowski (E.S.R. vol. xxx., No. 1, Jan. 19, 1914) adhere to this theory of a toxic substance in the diet leading to an intoxication. Chamberlain, Wedder and Williams (E.S.R. vol. xxviii., May 1913, No. 6) believe that beri-beri and polyneuritis of chickens result from some deficiency of substance in phosphorus in the diet. Many other authors have various theories concerning the deleterious substances in rice. The general opinion is that polished rice is harmful; these experiments tend to prove that rice-meal also either possesses the toxic quality or else is lacking in some necessary constituent. Personally, I incline to the theory that a toxic is the cause of the trouble. The strongest argument in favour of this theory is that immediately the rice-meal is stopped the pigs improve. Also it was found that after a purgative there was immediate improvement.